

TREATISE

OF THE

MATERIA MEDICA.

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IN TWO VOLUMES.

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PREFACE.

THE Lectures on the *Materia Medica* formerly published in my name, though very incorrect, were so well received by the public, that, notwithstanding my endeavours to prevent it, they have been several times reprinted, and even translated into foreign languages.

This mark of public favour led me to think of giving a more correct and complete edition of those Lectures. But finding that it was not possible for me to give it with the corrections and supplements which would be necessary, in a satisfying manner, I have long abandoned that idea, and judged it more proper to give an almost entirely new work; which I endeavour to do in the present publication.

In this work I must acknowledge the omission of many articles which have commonly found a place in treatises on the same subject. For such omissions it is proper for me here to account.

The various nomenclature of the several substances treated of, I did not think it necessary to detail, as it may be readily obtained elsewhere; and particularly I have not attempted to ascertain the nomenclature of the ancients; both because of the difficulty that attends such a labour, and because the utility of it appears to me very doubtful. In this last respect, if any one shall differ from me, he may find enough of it in other writers; none of whom, however, have ascertained the matter so clearly as to prevent the many ill-founded and useless transcripts and quotations from the ancients which still too frequently appear.

In ascertaining the species of plants, where several of the same genus may be employed, I have purposely omitted entering into any critical discussion which of them is the most proper for the purpose of medicine. This is often a necessary labour. But I thought it enough for me, in the Catalogue which I have prefixed to my Treatise, to mark the botanical distinction of the species I judged most fit to be employed, and of which only I intended to treat in the after parts of my work.

A third, and perhaps more considerable, omission which I have to account for, is, the not giving any description of the medicine as it is employed, or fit to be employed. This, however, I have omitted, because I could not do it so completely and accurately as the authors to whom I shall refer, and whom I suppose my readers to have in their hands.

That I have not given the chemical analysis of the several substances, is an omission, which, if I mistake not, will require no apology in the present age. I have omitted it, because I judge it to be of no use in explaining or ascertaining the virtues of medicines.

Any person who is of a different opinion, may find such analysis in the accounts of the Academy of Sciences, as they are fully and faithfully given in Mr. GEOFFROY's Treatise on the *Materia Medica*.

Though I may be readily excused for omitting the chemical analysis, I doubt whether I shall be so easily forgiven for frequently omitting the treatment of substances by the application of different menstruums, and for not mentioning the quantities of extract that are obtained from each of them. An attention to this is very necessary in the pharmaceutic treatment of medicines: and I have frequently pointed out the application of it. But I did not think it proper to increase the bulk of my Work by details contained in books to which I refer, and which I wish to recommend to all my readers.

From the omissions above mentioned, and from others that may be observed, it will be readily perceived, that the following Work is not offered to the public as complete and sufficient for every class of students. I do not indeed suppose that it can be understood by persons who have no previous knowledge of the *Materia Medica*, or who have never read other books on the subject. On the contrary, I wish that other books may have been read; though from what I have said in my history of the several writers, it will appear that very few of them are to be read with advantage or even with safety, and I find it difficult to point out a selection.

There are however three works, which I can venture to recommend, and which I wish to place in the hands of all my readers. These are the Treatise of the *Materia Medica* by Dr. LEWIS, as now published by Dr. AIKEN; the Treatise of PETRUS JONAS BERGIUS on the *Materia Medica*, taken from vegetables; and the *Apparatus Medicaminum* by the learned Professor of Gottingen, Jo. ANDREAS MURRAY, Knight of the royal order of Wasa.

In these three books, a student will find the omissions I have mentioned above, fully and correctly supplied. I wish him also to consult them for another purpose, as he will there find the grounds and occasions of many of the reflections which I have offered in the course of this present Treatise.

Having thus taken notice of the omissions in this publication, and the means by which many of them may be supplied, I am now to mention in general what my Treatise contains, and what apologies may be necessary for its various imperfections.

I have not attempted to give a full account of all that might be said of the several subjects of the *Materia Medica*. My chief purpose is to give the principles upon which those substances are to be judged of as medicines; to correct the errors of former writers in that respect; and to offer some new principles and doctrines which to me appear to be necessary. These doctrines are given partly in my general introduction to the whole, and partly in the reflections on the general operation of medicines, which I have prefixed to the several chapters. These discussions have extended that introduction, as well as some other parts of my Work, to a length beyond what might have been expected; but the state both of physiology, and pathology, for ages past, over the greatest part of Europe, led me to think such discussions necessary. These speculations may often ap-

pear doubtful, especially to persons little exercised on this subject. I hope, however, they are well founded; and I offer them with entire deference to the judgment of the public.

In assigning the virtues of medicines. I have avoided the compilations which have been so often injudiciously made, by repeating almost every thing that had been said before on the subject, and commonly without any proper distinction of authorities or of probabilities. In this business I have avoided the fault which GALEN imputed to DIOSCORIDES, and which has been the fault of almost every writer on the *Materia Medica* since his time, that is, of ascribing too many virtues to one and the same medicine.

I have, on the contrary, been sparing in assigning virtues: and I have assigned those only which are founded upon a nice selection of authorities; such as seem to me to be consistent with the laws of the animal œconomy; and especially such as I have had confirmed by the experience which an extensive practice of fifty years has afforded me an opportunity of acquiring.

It may be alleged that I seem to be very sceptical with respect to the assertions of writers on the *Materia Medica*; and it may be true that I have been perhaps too rigorous in that respect. But I am persuaded that every practitioner of judgment and extensive experience must to a very great degree become sceptical upon the same subject. As my doubts, however, have arisen chiefly from my own experience, I must in candour admit, that my experience, like that of every one else, may be fallacious, especially in concluding from negative experiments. In all cases, therefore, where medicines show active parts, I advise farther trials to be made, as I may not have employed large enough doses, nor have adapted them properly to the circumstances of disease.

It may be further observed, that through the whole of this Work, I have omitted a number of articles entirely, and have been brief upon many others to be commonly found in books, while on some others I may seem to be rather diffuse. This I acknowledge to be true; but I flatter myself that the articles omitted, or passed over slightly, will be found by most judges to be such as do not deserve more particular notice. I should indeed have omitted more than I have done, had it not been that I judged it necessary to correct the assertions frequently to be found in the writers on this subject.

With respect to the articles on which I may perhaps be accused of prolixity, they will be found to be upon subjects the most important, and the most frequently employed in practice; such as *Milk*, *Peruvian Bark*, *Opium*, *Camphire*, *Mercury*, and several others. In considering such subjects, I wished to ascertain, with some precision, their use in the great diversity of diseases, and circumstances of disease, in which they have been employed.

Throughout the whole of my Work, to support my reasonings, and to authenticate the facts adduced, I have quoted the testimony of writers, whom I myself, and I believe the public, esteem. But it may be complained of, that in doing this, I have not always specified the particular works, or the parts of the works, of the authors I refer to. This indeed is a defect: but the supplying it would have re-

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THE
HISTORY
OF THE
MATERIA MEDICA.

WITH SOME ACCOUNT
OF THE CHIEF WRITERS UPON IT.

IT is sufficiently probable, that very soon after the first beginnings of human society, some art of physic and some knowledge of remedies arose amongst men: and accordingly, no country has been discovered, among the people of which, however rude and uncultivated in other respects, an art of physic and the knowledge of a great number of remedies has not been found. The invention of remedies amongst the rudest people may in a great measure be accounted for, from the instincts arising in certain diseases; from the observation of spontaneous cures effected by the powers of the animal œconomy; from accidental errors in the choice of aliments; and even from those random trials to which pain and uneasiness often lead. But it is not necessary to insist on such speculations at present; and it is still less requisite to repeat here the many frivolous and fabulous accounts that have been given of the invention of particular remedies and medicines.

In whatever manner these may have been first invented, every account we have of the progress of arts amongst men informs us, that the art of physic and the knowledge of remedies have had a share in that progress; and that at all times the urgency of disease, and the knowledge of a few remedies, have engaged men in a constant endeavour to increase the number of them.

In what manner this proceeded in different countries in ancient times is not exactly known. The most ancient account we have of arts, is that of their being cultivated in Egypt, but we know few particulars of the state of them there that deserve to be taken notice of: and with respect to medicine in general, it is needless to inquire, as it is known to have been under such regulations as must have been a certain obstacle to its progress and improvement.

The first distinct accounts of the art of physic, as exercised by a particular class of men, are those we have of it in Greece among the priests of *Esculapius*. It would seem, that for some time these priests, if not the sole, were at least the chief practitioners of physic in that country; and as the trade was lucrative, it is to be presumed, that these practitioners would endeavour to become knowing

in it, and consequently to extend and enlarge their knowledge of remedies. In the temples of Esculapius, therefore, it is probable that a stock of knowledge was preserved, and transmitted down from one set of priests to their successors: and at the same time, these temples afforded a particular means of preserving the knowledge of the *materia medica*; for we know it to have been then common for persons who had not been cured of diseases by the remedies prescribed to them in the temple, to hang up their votive tablets, on which were written some account of their disease, and of the remedies by which it had been relieved.

It is not my business here to trace the progress of physic in Greece; but we may in general observe, that it had its first beginnings in the temples of Esculapius; that these were the first schools of the art; that the first writings upon it were produced there; and that the first clinical practitioners were sent out from these temples. The celebrated *Hippocrates* was one of these; who, after having been instructed in the knowledge of the school of Cos, and probably also well acquainted with that of Cnidus, became an itinerant and clinical practitioner.

Very few accounts remain of the medicines employed in the temples of Esculapius; and it will readily occur that the first correct information must be expected and sought for in the most ancient medical writings now remaining, and which are those commonly ascribed to Hippocrates. These writings, however, at least for the purposes of history, afford a precarious and uncertain information; for, as we now have them collected together, they are certainly the works of many different persons, as well as of many different ages; insomuch that it is impossible, with any clearness, to judge what was the true state of the *materia medica* in the time of Hippocrates. Besides, if we reflect in how many instances the nomenclature is entirely unknown, and in how many it is very doubtful and uncertain, we shall be satisfied how idle it is in modern writers to quote the authority of Hippocrates for the virtues of almost any medicine. Indeed, laying aside our partiality for that celebrated person, there can be no just ground for supposing, that at the period in which he lived, much discernment in the *materia medica* could have prevailed; and it is hardly necessary to add, that even although the substances named in those writings were known to us with more certainty than they are, yet the distinction of diseases and of their circumstances are so seldom given, that at present we can hardly be guided by them in employing any of the medicines they suggest.

Soon after the age of Hippocrates, *Aristotle* and *Theophrastus*, by laying the foundation of natural history, paved the way for a great improvement in the knowledge of the *materia medica*: but in ancient times, that improvement was never carried far; and consequently for want of the means of accurately distinguishing

substances from one another, this branch of physic remained in much uncertainty and confusion.

For a long time after the age of Hippocrates, we have hardly any of the writings of the eminent physicians of Greece, at least any of known date, from whence we might learn the progress of the materia medica amongst them. We may presume, however, that they were constantly endeavouring to find out more efficacious medicines; and therefore, upon the whole, increasing their number. At the same time this seems not to have been the case with *Erasistratus*; who is said to have employed few medicines, and those only of the milder kind; and to have declared against the compound medicines, which even in those days were studiously attempted.

Although Erasistratus, by this conduct, might in some measure retard, yet there were others who at the same time favoured the progress of the materia medica, and particularly the equally celebrated anatomist *Herophilus*, who was nearly his cotemporary. This person, who held a distinguished rank amongst the physicians of Greece, was very much employed in quest of remedies; and probably gave so much encouragement to this study, as to make his disciple *Philinus* of Cos devote himself entirely to empiricism. Philinus is by many supposed to have been the author or founder of the sect of professed empirics which appeared immediately after that time: But whether we suppose Philinus, or with more probability *Serapion* of Alexandria, to have been the author of that sect, certain it is, that it arose immediately after the time of Herophilus; and this period might be considered as one of the most remarkable in the history of physic in general, or of the materia medica in particular. It produced, however, no considerable revolution in either the one or the other.

What the empirics contributed to the reformation or improvement of physic is not now known. *Heraclides* of Tarentum was of the empiric sect, and is said to have been a person of judgment and diligence in the study of the materia medica; but neither his writings, nor those of any other of the same sect, now remain, nor are there any clear accounts of their improvements now to be found. This seems to afford a pretty certain proof that their labours were very fruitless: for had they discovered any new remedies, or ascertained more exactly the virtues and proper administration of those already known, it may be safely presumed, that such improvements would have been adopted and preserved by the practitioners of every other sect.

The scheme of the empirics was sufficiently specious, but the accomplishment of it was only to be attained in the course of many ages: and therefore, while men constantly found it incomplete and imperfect, as it is even at the present day; practitioners were ever ready to desert it, and to seek for those aids which

were promised by the other plans of physic. These remarks on the ancient empirics may perhaps enable us to account for the very imperfect state of the *materia medica*, not only among the ancients, but also at all times since, in so far as it depends upon experience alone.

Although such had been the slow progress of the *materia medica* among the physicians of Greece, it might be expected to have received some improvement when physic came to be established at Rome. This, however, if it took place at all, was to be ascribed to the Greek physicians who came and practised there; for amongst the Romans themselves the art had remained long in a rude and imperfect state. Of this we have a strong evidence in the works of *Cato* the Censor, which yet remain: for in these we have incantation given for the reduction of a luxation; and the brassica seems to have been with *Cato* an almost universal remedy. This may serve to show, that we are not to inquire after the *materia medica* among the Romans themselves, but amongst the Greek physicians who practised at Rome.

The first of these who became of eminence was *Asclepiades*. He had not been originally devoted to the profession of physic, and in entering upon it seems to have formed a system for himself: but if he followed any of the great physicians of Greece, it was *Erasistratus*; who established a mild practice, employed few medicines, and declared strongly against the luxuriance of composition which was then attempted. Like him, *Asclepiades* seems to have employed a small number of medicines only, and therefore contributed little to the study of the *materia medica*.

Although he acquired great authority amongst the practitioners of Rome, yet there were probably few of these who could enter into the subtleties of his theory; and it was this difficulty which gave occasion soon after to the establishment of the sect called *Methodic*. The plan, however, of this sect, confining them to three general indications only, was by no means suited to enlarge the *materia medica*; which accordingly does not seem to have been an object of their cultivation.

Upon this occasion, it is proper to take notice of the elegant *Celsus*, who lived at this period, and was the only native of Rome who ever became distinguished in the line of physic. Though perhaps not strictly of the profession, he was undoubtedly often engaged in the practice; and in his writings we have many proofs of his discernment and good judgment. In his works we find a great deal more relating to the *materia medica* than in those of any former author; many medicines being enumerated by him, and a judgment given with respect to them. Unfortunately, however, we are under such uncertainty with regard to his nomenclature, that we cannot always be determined in our judgment

respecting the propriety of his doctrines. He is particularly full in his account of alimentary substances: so that it is with respect to these we can best judge of his opinions; and it is there we find some singularities which we can hardly approve of. In modern times, much mischief has been imputed, perhaps not very justly, to the *farinacea non fermentata*; and few moderns therefore will approve of Celsus in preferring the *panis sine fermento* to the *panis fermentatus*.

In many instances, his judgment, if we understood it well, might be found perhaps to be very good; but in other particulars, we cannot readily admit of it. Thus, in Book II. Chap. XVIII. where he is considering the quantity of nourishment in different aliments, he has the following assertions, which certainly do not discover any correct principles on the subject.

Omnia legumina, quæque ex frumentis panisficia sunt, generis valentissimi esse.

In media materia—ex quadrupedibus leporem: aves omnes a minimis ad phanicopteron.

Imbecillimam materiam esse—oleas, cochleas, itemque conchyliæ.

Ex avibus—valentior, quæ pedibus, quam quæ volatu magis nititur.

Atque eæ aves quoque quæ in aqua degunt leviores cibum præstant, quam quæ natandi scientiam non habent.

Inter domesticos quadrupedes, levissima suilla est.

Omne etiam ferum animal domestico levius est.

These opinions, and several of a like kind, will hardly at present be admitted as just.

With respect to Celsus, it is proper to mention, that before his time there had commenced a particular object of study which very much engaged him, and all the after-writers on the materia medica among the ancients. This was the study of poisons and of their antidotes. What the experience of Mithridates in this matter might amount to, I cannot positively determine; but a great deal of what the ancients have said on the subject of poisons, seems to have been purely imaginary. Indeed there can be no doubt that their doctrine of antidotes was frivolous and ill-founded; whilst, at the same time, the luxuriance of their compositions shows that they hardly had any discernment with respect to the particulars of the materia medica. Even Celsus himself is not to be exempted from this criticism.

This direction in the study of the materia medica, with respect to poison and antidotes, I should perhaps have mentioned before, by taking notice of a writer who lived long before Celsus, and some of whose writings still remain. This is *Nicander of Colophon*, whose poetical works, *Theriaca* and *De Alexipharmacis*, have been frequently published and commented upon, though it does not appear that they merited any such attention. His skill

in natural history appears to have been very mean and incorrect, and has much fable intermixed with it. His antidotes, in so far as we know them, or can judge of them from later experience, are very ill-sounded; and this, with their being crowded together into one composition, gives much reason to suspect that Nicander's knowledge of the several particulars of the *materia medica* was extremely imperfect.

After Celsus, the next writer on the subject of the *materia medica*, to be taken notice of, is *Scribonius Largus*, who treats professedly of the composition of medicines. With regard to him, we must give precisely the same judgment as with respect to Celsus. There occur in him the same uncertain and doubtful nomenclature; the same abundance of external remedies; and respecting the internal, the same inaccuracy in distinguishing diseases, as well as the like imperfection in marking the causes and circumstances of those to which medicine should be adapted. Together with all this, we find the same study of poisons and antidotes, and the same injudicious luxuriance of composition, which has disgraced the prescriptions of physicians ever since.

From this writer we perceive, that the same ungenerous selfishness of keeping medicines secret prevailed in ancient times, as it has often done since, to the reproach of the profession: and from the history of *Antonius Pachus* we find, that then, as since, these secret medicines were in a quackish manner held forth as almost universal remedies.

In Scribonius there occur also many superstitious follies with respect to remedies, which detract very much from the good sense and philosophy of those days; and such indeed occur not only in him, but in Pliny, Galen, and all the other writers of ancient times.

The luxuriancy of composition would seem to have been at its height about this time in the hands of *Andromachus* senior; and it affords a certain proof of the very slow progress of discernment in the business of the *materia medica*, that even to the present day the compositions of *Andromachus* have retained a place in our Dispensatories. Even the London College, who, in their Dispensary of the year 1746, had shown so much discernment and judgment in correcting the luxuriancy of composition, still retained the *Theriaca Andromachi* in its ancient form; which though perhaps contrary to the judgment of some of the members, yet discovered how much many of them were still governed merely by the power of habit.

After mentioning the time of *Andromachus*, we are arrived at a remarkable period in the history of the *materia medica*, which is that of the time of the much esteemed *Dioscorides*. This author, who probably lived in the time of the Emperor Vespasian, is of those now remaining who wrote professedly on the subject, the

most ancient. He is commended by Galen as one of the best and most complete writers on the materia medica; and he is remarkable for having been considered ever since as the principal and classic writer upon it. He has accordingly been transcribed and repeated by almost every writer since; but that this has been owing to the real value of his writings, it is not easy to perceive.

Dioscorides has given us a large list of medicines, with some opinion respecting each; but as his descriptions are very imperfect, and the nomenclature has been since very much changed, we are often uncertain what the substances are which he treats of, and therefore cannot always judge how far the virtues ascribed to them are well founded. In several respects, however, his judgment in general may be suspected. When we find him so often ascribing to substances the power of resisting the poison of serpents and other animals, and even of curing the bite of mad dogs; when he gives us many medicines for dissolving the stone in the bladder, for consuming the spleen, for moderating the venereal appetite in males, and for preventing conception in females, for promoting the birth of children, and expelling the secundines and dead fœtus, and for making children black-eyed; the ascribing these and other improbable virtues, gives me a mean opinion of the judgment of Dioscorides, or, if you will, of the physicians of his time, in this business. Linnæus, by the character of *Experta*, which in his list of writers he annexes to the writings of Dioscorides, seems to consider these writings as the fruits of experience; but I cannot believe that Dioscorides had consulted experience when he attributed to so many medicines the power of promoting urine, and of exciting the menses. Such powers may truly exist in many medicines; but it may be truly asserted, that they are not to be found in one of a hundred to which Dioscorides has ascribed them.

In many parts of his writings, where he treats of substances which we may be supposed acquainted with, the justness of his skill in assigning virtues is very doubtful; and to me he appears to be not only mistaken, but sometimes inconsistent with what he has said in another place. In many instances he is loose and undistinguishing with respect to the circumstances of diseases to which medicines are to be applied; and often pointing them out only as being useful in general, as in *Vitiis renum*, *Pulmonum*, *Vulvæ*, &c.: but such opinions are generally useless, and may be often misleading and pernicious.

From these considerations, I cannot join in that superstitious regard which has been so generally paid to Dioscorides; and must deem it to have been rather unfortunate for the study of the materia medica in modern times. It has certainly been unlucky, that more labour has been bestowed to ascertain the medicines pointed

out by him, about which we are doubtful, than in ascertaining the virtues of those substances we are acquainted with.

Nearly at the same time with Dioscorides, or soon after, lived the elder *Pliny*, another copious writer on the *materia medica*. This truly learned man was, however, as upon most other subjects, so in particular on that of the *materia medica*, a mere and often an injudicious compiler. He has frequently repeated after Dioscorides, or the authors whom Dioscorides had himself borrowed from: although, being hardly in any case a practitioner in physic, he was perhaps less fit than Dioscorides for making a compilation on this subject. With respect to his writings on the *materia medica*, we can only say, that every difficulty and every fault that occur in the writings of Dioscorides occur also in those of Pliny.

In justice to the latter it must, however, be acknowledged, that he discovered more judgment than his cotemporaries, in condemning the very luxuriant compositions which at that time were so much affected. After mentioning the number of ingredients in *Mithridatium Antidoton*, and taking notice of the small proportion of some of them, he adds, “*Quo deorum perfidiam istam monstrante? Hominum enim subtilitas tanta esse non potuit. Ostentatio artis et portentosa scientiæ venditatio manifesta est.*”

Soon after Pliny appeared the celebrated *Galen*, from whose extensive knowledge and erudition, and especially from his large experience in the practice of physic, we might have expected a great improvement of the *materia medica*; but we are much disappointed, as we find nothing in his writings sufficient to excuse the insolence with which he treats his predecessors, nor to support the vanity he discovers with regard to his own performances.

On the subject of the *materia medica*, he attempted what was very much a new system. He maintained, that the faculty or power of medicines depends chiefly upon their general qualities of heat and cold, moisture and dryness. He observed, that the writers before him had supposed the same; but that their doctrines could not be usefully applied, because they had not observed the various combination of these qualities, and much less the various degrees in which the quality might be in every particular substance. All this Galen endeavoured to supply: and for that purpose he supposed that every quality might be in four different degrees, and that its powers would be in proportion to these; and when he treats of particulars, it is chiefly to tell us what are its general qualities, and the different degrees of these in each. His judgment of these is not taken exactly from the sense of taste and odour which every subject affords, or from any other measure which could then be applied: Even the general qualities, and more so their several degrees, are hypothetically and much at random assigned. Though the whole of the doctrine were better founded,

I need not say that it would not apply to the ascertaining the virtues of medicines; and Galen himself takes notice, that certain virtues do not depend upon the general qualities, but upon somewhat not easily ascertained in the whole of the substance.

Though the doctrine in general was false and inapplicable, yet, it was received and implicitly followed by all the physicians of Greece who came after Galen; and indeed by all the physicians of Asia, Africa, and Europe, for at least 1500 years after his time.

To judge further of the state of the materia medica in the time of Galen, we must observe, that in treating of particular substances, besides giving us the state of the cardinal qualities in each, he gives us sometimes particular virtues which might not seem to arise from the general qualities; but in this he is not more correct, or, if I might be allowed the expression, not more wise than Dioscorides. The resisting the poison of serpents, and even of mad dogs; the dissolving the stone in the bladder; the consuming the spleen; the expelling the secundines and dead fœtus, and some other equally improbable virtues, he ascribes to various substances. He justly finds fault with Dioscorides for attributing too many virtues to the same substances; but he is not himself every where free from the same fault. It might have been expected that he would frequently have appealed to his own experience; and sometimes, though very rarely, he does so: although he had done it more frequently, there are passages in which we cannot admire the accuracy of his discernment.

In repeating after Dioscorides the virtues of the damasonium, he adds, "*Sed nos ea quidem experti non sumus: quod autem constitutos in renibus calculos, aqua decocta fuerat pota comminuat, id certe experti sumus.*" On the lapis Judaicus he has this remarkable instance of his experience: "*Ad vesicæ lapides*"—"in quibus nos experti sumus, proficit nihil, quod ad lapides vesicæ pertinet; verum ad eos qui in renibus hærent, efficax est." Other examples may be given of Galen's false experience: but it will be sufficient to remark, that there can be no stronger proof of this, than when a person imputes effects to substances absolutely inert with respect to the human body: and such are the various superstitious remedies, sympathetic cures, and most of the amulets that have been employed as remedies. Galen gives us a remarkable instance on the subject of pæony. He is probably the author of the anodyne necklace, so long famous among the great and little vulgar of England. If he had taken his opinion of the pæony from the testimony of others, or even from the theory he has here laid down in favour of its possible virtue, I should have been ready to excuse him; but when he gives it as a matter of his own particular experience, I must suspect either his truth or his discernment.

Here is his account, as translated by Charterius—"Eo propter haud desperaverim, eam (quod merito creditum est) ex collo pueris suspensam comitalem morbum sanare. Equidem vidi puellum quandoque octo totis mensibus morbo comitali liberum, ex quo hanc radicem gestavit; ac postea forte fortuna quum, quod a collo suspensum erat, decidisset, protinus denuo convulsione correptum: rursusque suspenso in locum illius alio, inculpate postea egisse. Porro, visum est mihi satius esse rursum id collo detrahere, certioris experientiae gratia. Id quum fecissem, ac puer iterum esset convulsus; magna recentis radicis parte ex collo ejus suspendimus; ac deinceps prorsus effectus est puer, nec postea convulsus est." He adds his explanation of this event, which I need not consider, as at any rate it will hardly apply to the fact that he gives in the same paragraph, of some threads tied about the neck of a viper so as to suffocate it, and afterwards tied about a patient's neck, and curing all sorts of tumors arising in it.

Besides his Treatise of Simple Medicines, Galen has given us two other works that may throw some light on the state of the materia medica in his hands. One of these works is his Treatise de Compositione Medicamentorum secundum locos; that is, as they are adapted to the several parts of the body. In this we have a large collection of compound medicines; and the largeness of the collection which appears in the number of compositions for the same disease, and the number of ingredients in most of the compositions, show sufficiently to me the great want of discernment in the nature of medicines. This want of discernment appears fully enough in Galen himself: for although he is not indeed without giving us his own judgment, yet certainly, from his own observation or experience, he had not arrived at any nice judgment, when the work I have mentioned is almost entirely a compilation from Andromachus, Asclepiades, Pharmacion, Archigenes, and a number of other writers who had gone before him.

We have thus said enough of the materia medica of Galen, and perhaps more than it deserved: but as his system continued to be implicitly followed so long after his own time, it seemed proper to show what was, almost entirely the state of the materia medica till the middle of the 17th century; and as there are still in late writings many remains of what was derived from Galen, I was willing to show upon how bad a foundation many of these writings have been compiled, and particularly to mark out how much a veneration for antiquity has retarded the progress of science in modern times.

After Galen, no change in the plan of the materia medica was made by the physicians of Greece; and although in *Ætius*, *Oribasius*, and some others, there are large compilations, on the subject, yet they are nothing more than compilations, conspicuous for the

same imperfections which are so remarkable in the writings of Galen himself.

When the knowledge of physic had very much declined among the Greeks, it happened to be transferred to the Saracens, whom we commonly speak of under the name of Arabians; and these for some time were almost the only persons in Asia and Africa who cultivated science. Amongst them, in a climate which had not been before examined, several of its productions, learned perhaps from the natural physic of the people, were added to the *materia medica* of the Greeks, and probably with some improvement; as in place of the more violent and drastic purgatives of the Greeks, the Arabians substituted several of a milder kind. In no instance, however, that I can perceive, did they discover any medicines of peculiar power; and as they had derived almost the whole of their knowledge of physic from Greece, so in every part of it they had adopted very entirely the system of Galen. In particular, it does not appear that they made any improvements, either in the general plan of the *materia medica*, or in ascertaining the virtues of particular medicines.

In one instance, however, they laid the foundation of a very considerable change which afterwards more fully took place in our subject; for it was certainly amongst them, that for the purpose of medicine, substances were first operated upon, and were prepared by the peculiar operations of chemistry.

In the same state that physic was amongst the Arabians, it was, after a long age of ignorance, revived in the western parts of Europe, by schools that were established there by the Arabians or their disciples. It was revived, however, among men not only in the lowest condition with respect to science, but of no industry or activity in the pursuits of it; and from whom, therefore, nothing new was to be expected. Accordingly, nothing new appeared among the physicians of Europe, while they continued to be the servile followers of the Arabians.

At length, about the middle of the 15th century, the taking of Constantinople by the Turks having forced many learned Greeks to take refuge in Italy, this event, together with some other circumstances, gave rise to the study of the language, and thereby to the literature of the Greeks in the western parts of Europe.

The physicians becoming thus acquainted with the writings of the ancient Greeks, soon perceived that these were the chief sources from whence the Arabians had drawn their knowledge, and very properly applied themselves to the study of the original writers. From thence having observed that in some particulars the Arabians had deviated from the practice of the Greeks, they set themselves to criticise the Arabians, and to correct the errors derived from them, which then prevailed. This produced some controversies

between those who followed the Greeks and those who still tenaciously adhered to their Arabian masters; and these controversies continued for some part of the 16th century. By degrees, however, the Greek party prevailed, and the Arabians came to be generally neglected; though it is curious to be observed, that so late as the middle of the 17th century, Rolsinck, a professor of Jena, read lectures upon the Arabian Rhazes, and Plempius of Leyden published and commented upon a work of Avicenna.

Upon this occasion, I could not avoid touching this part of the history of physic, though it has little relation to our subject; which, during the period mentioned, made very little progress among persons who were almost entirely the bigotted followers of the ancients. Whether they followed the Greeks or the Arabians, it was chiefly, and almost only, the system of Galen which both parties adopted; and the materia medica, with a few additions by the Arabians, continued to be much the same as it had been delivered by Galen himself; being every where explained by the cardinal qualities and their different degrees, with very little reference to any thing acquired by experience.

The system of Galen, almost alone, had now subsisted in the schools of physic, from his own time in the 2d century after Christ, till the 16th was pretty far advanced; and it is well known to have happened at all times, that of the persons who apply to science, the greatest part implicitly receive the doctrines delivered by their masters; which having once imbibed, they adhere to them with a degree of bigotry that opposes every attempt towards innovation and improvement. Such was the condition of the state of physic with the followers of Galen at the beginning of the 16th century, that it required some violent efforts to shake off the torpor and vanquish the bigotry of the Galenic school; and although the reformation which happened was not conducted with the discretion that might have been wished, yet it was fortunate for science that such a revolution took place at this time.

It has been already remarked, that chemistry appeared first among the Arabians; and it is probable that some of their first operations were upon metallic substances. Accordingly, we find a preparation of mercury mentioned in Rhazes; and it is pretty certain, that in the immediately following ages the chemists were busy in their operations upon antimony: for the *Currus Triumphalis Antimonii* published under the name of Basil Valentine, and supposed to have been written about the end of the 15th or beginning of the 16th century, mentions a great variety of these preparations.

Although the progress of this business cannot be precisely traced, yet there is good ground to believe, that the chemists very early directed the employment of their art to the preparation of medi-

cines; and, agreeable to the fanatical spirit which so generally prevailed among them, they conceived the idea of preparing an universal medicine, and one which should protract life to a thousand years.

How they succeeded in these visionary schemes, need not now be told: but it is certain that many of them became empirical practitioners of physic; and it is probable that the medicines they employed were violent, and were therefore avoided by the timid and inert regulars of those days. One of the latter, Gordonius, author of the *Lilium Medicinæ*, gives us this account of the opinion which then prevailed with regard to chemical medicines: "Quia (says he) modus chemicus in multis utilis est, sed in aliis est tristabilis quod in ejus via infinitissimi perierunt."

In this situation matters stood at the beginning of the 16th century, when the famous *Paracelsus* appeared. He does not appear to have studied in any of the established schools of those days; but, determined to follow his father's profession, which was that of physic, he seems to have travelled about in quest of remedies amongst all sorts of people, and particularly among the chemical practitioners of those times. From these he learned the use of mercury and antimony; and from some hardy empirics, the use of opium; at least, a more free use of this than was then common. By employing these remedies, he was enabled to cure many diseases which had baffled the inert remedies of the Galenists: and being of a bold and boastful disposition, he made the most of these accidents; while at the same time, the partiality of mankind to empiricism soon contributed to give him great fame.

He was so far more fortunate than any former chemical practitioner had been in acquiring a general reputation, that he was called to a professor's chair in the University of Basil. In this situation he found it necessary to become systematic; and making use of such theories as he could derive from his predecessors in chemistry, upon these grounds attempted a system of physic, blended with most extravagant and visionary doctrines, supported and covered by a great deal of new and unmeaning jargon of his own. His lectures were chiefly employed in recommending his own chemical remedies, and declaiming in the most outrageous manner against the established schools of physic. He did not, however, continue long in this employment; for his boisterous temper engaged him in measures which soon obliged him to leave both the university and city of Basil.

His history after this is pretty well known; and it is only requisite to say, that he gave occasion to the forming a sect of physicians who appeared in opposition to the established schools, then entirely followers of Galen. The chemists employed a set of remedies which the Galenists very violently opposed; and for a hundred years afterwards, the physicians of Europe were divided

into the two sects of chemists and of Galenists. The chemists were men of little erudition and of mean parts, and delivered theories full of jargon and nonsense; but against all this the efficacy of their medicines supported them, and increased more and more their credit with the public. Their encroachments on the trade were felt by the Galenists, and produced a violent opposition, supported by all that bigotry which is common to schools long established, and of which the Galenists still held the entire possession. Upon this occasion the Galenists were imprudent: for they assailed their antagonists, not in their weak, but in their strongest quarter; and attacked with intemperate violence, all those powerful and efficacious remedies by which the authority of the chemists was supported. This happened particularly in France, where the Galenists called in the aid of the secular arm, and employed it to oppress their adversaries.

It was in Germany that the chemical practitioners especially prevailed; and there was hardly a sovereign court in that country, in which an alchymist and a chemical practitioner of physic were not retained. Even the Galenical practitioners there came soon to employ the remedies of the chemists; and Sennertus, one of the most eminent Galenists of Germany, endeavoured to reconcile the two opposite parties.

Linacre and *Kay*, the restorers of physic in England, were zealous Galenists; but as no regular school of physic was ever well established there, the persons destined to physic chiefly resorted to the schools of Italy and France, where they generally became Galenists. And although the London college showed some disposition to oppress the chemical practitioners in the person of *Francis Antony*, it was more under the pretence of checking quackery than opposing chemistry.

Very early in the 17th century, *Sir Theodore Mayerne*, who as a chemical physician, had been much opposed and oppressed by the Galenists of France, was called over into England, where he was appointed first physician to the king, and continued to hold that office for more than thirty years after. His theory and his prescriptions were very like those of the Galenists; but he was a great favourer of chemical medicines, and particularly of antimony; the medicine with regard to which the two sects were most especially divided. It does not, however, appear, that upon this account he met with any opposition from the physicians of England; and indeed, on the contrary, we find him becoming a member of, and acquiring great authority, in the London college. It is probable that his great credit put an end, in England, to all distinction between the Galenic and chemical practitioners; and as in the year 1666 the faculty of Paris rescinded their arret discouraging the use of antimony, there was thereafter hardly any where a distinction to be found between Galenists and chemists.

This detail of the progress of chemical physic, and of the conflict which happened between the chemists and the Galenists, seemed necessary in order to explain the state of the materia medica in modern times; and it merits peculiar attention, that in the course of the 16th century, the introduction of the more frequent use of chemical medicines, and of the more frequent application of chemistry to their preparation, produced a very great change in the state of the materia medica. Fossil medicines, and some of them entirely unknown to the ancients, came now to form a much greater part of it than formerly; and not only those of the metallic, but many of the saline kind, little known before, were now introduced. The Galenists had in some degree employed distilled waters, and extracts: but now the chemists subjected a much greater variety of substances to those operations; and hence distilled waters, essential oils, quintessences, and extracts, came, with those who admitted of chemical remedies at all, to constitute almost the whole of the materia medica. Many of these preparations were indeed injudicious, and the employment of them was without discernment; but the virtues ascribed to them entered into the writings on the materia medica, and have been frequently repeated since. These pretended virtues are often asserted as from experience: but among the many deceivers in the business of the materia medica, none have been more frequently such than the chemists.

Whilst chemistry was thus employed to modify the materia medica, it was accompanied by every species of fanaticism; by the doctrines of astral influences, animal magnetism; by pretensions to alchemy, to panaceas, and to medicines capable of prolonging life. All these had some influence on the materia medica; but none were ever more generally received than the doctrine of signatures; and which has had its influence even till very lately. The Decoctum ad Ictericos of the Edinburgh Dispensatory 1756, never had any other foundation than this doctrine of signatures in favour of the Curcuma and Chelidonium Majus.

The doctrines of chemistry, though attended with so many absurdities, were, however, the most promising towards explaining that quality in medicines upon which their virtues depended; and accordingly have ever since been more or less applied to that purpose. After the vague and unmeaning theories and jargon which the chemists on their first appearance introduced, the first appearance of system was that of the doctrine of acid and alkali, which continued to have a great share in medical doctrines for a long time after; so that according to the fancy of the physician, the causes of almost all diseases were referred to an acid or an alkali prevailing in the human body; and remedies accordingly were arranged as they possessed the one or the other principle. Thus we find *Tournefort* trying every vegetable juice by experiment, to discover in it the mark of acid or alkali: but it was soon found that

this system was too general to admit of its being applied to any extent, and that it was necessary to inquire more particularly into the constituent parts of medicinal substances. At the same time, this was still expected from chemistry; and accordingly the Academy of Sciences engaged some of their members to make the *Chemical Analysis*, as it is called, of almost every medicinal substance; and which, I believe, was executed with great accuracy. It was, however, soon perceived, that substances of very different, and even of opposite qualities in medicine, gave out in a chemical analysis, very much the same products; and it was therefore also perceived, that these analyses hardly threw any light upon the medicinal virtues of the substances treated in that manner.

It was about this time, that certain physicians, who presumed to judge of the constituent parts of medicines, partly from their chemical analysis, partly from their sensible qualities, formed plans of materia medica. Such was that of *Herman* the professor of materia medica at Leyden, in his little work, intitled *Lapis, Materiae Medicæ Lydius*: but to any person considering this work, it will be obvious, that the author has often determined the constituent parts at random, and that his doctrine is neither clear, correct, nor applicable; though it has still remained long amongst the doctrines of the materia medica.

It has almost at all times been supposed, that the virtues of medicines were so strictly connected with their sensible qualities of taste and smell, that from thence the knowledge of their medicinal virtues was to be acquired. Accordingly, these sensible qualities have been generally taken notice of by the writers on the subject; and Sir *John Floyer*, as well as others, has thereupon attempted to build an entire system; but with little success, as we shall have occasion to show hereafter.

After all the schemes at any time formed for investigating the virtues of medicines, it will be readily acknowledged, that the conclusions formed from any of them can hardly be trusted till they are confirmed by experience; and though this also may often prove fallacious, it is much to be regretted that so little pains have been taken by our writers to obtain this test in favour of the virtues they ascribe to medicines. Some attempts, indeed, in this way have been made; and the sagacity and judgment of *Conrad Gesner*, had he been at leisure to prosecute this inquiry, would have been of more service than the multitude of compilations which have been made. What has rendered the alleged results of experience less useful shall be said in another place; but in the mean time, it will be proper to take notice of two attempts which were made in England to consult experience with respect to the materia medica.

The first was by *Mr. John Ray*, who in attempting to give a complete history of plants, thought it incumbent on him, as many

other botanists have idly supposed it, proper for them to enumerate the virtues of the plants used in medicine. In this, however, Mr. Ray has chiefly copied from preceding writers, and particularly from John Bauhin and Schroeder; but wisely perceiving that the proper foundation was experience, he applied to many of his friends engaged in the practice of physic; and from some of these has given us a number of experiments, which have been since transcribed by Geoffroy and other writers. Either, however, from the fallacy of experience, or from the rashness of his friends in drawing conclusions from it, the value of Mr. Ray's reports is not so great as might have been expected.

About the same time Mr. Boyle endeavoured to engage the practitioners of physic in the study of specific medicines; that is, of medicines whose virtues are learned only from experience. There will be occasion hereafter to consider not only in what circumstances the doctrine of specifics may be admitted, but also how it is to be properly managed; and at present it is only necessary to take notice of its effects on the state of the *materia medica* at the end of the last century. Mr. Boyle, from the great benevolence of his disposition, was very diligent in inquiring after specific and experienced remedies; and has given us a collection of remedies which he supposed to be of this kind. From his want, however, of discernment with respect to the nature and state of diseases; from his not being sufficiently aware of the fallacy of experience, and perhaps from his being little on his guard against false information; his collection has contributed very little towards the improvement of the knowledge of the *materia medica*.

Soon after this, when it was perceived that the chemical analysis by the power of fire contributed nothing towards discovering the constituent parts of substances in which their medicinal virtues were especially to be found, it came to be very justly conceived, that a more simple and less violent means of resolution might better answer the purpose. Physicians and chemists, therefore, set about treating many vegetable substances, either by infusion and decoction in water, or by infusion in spirituous menstrooms, and obtaining extracts in consequence of these operations; and such labours still continue to be employed with great diligence. In many cases they have been useful in ascertaining whether the medicinal virtues were best extracted by watery or by spirituous menstrooms; whether the virtues resided in a volatile or in a fixed substance; and whether they were chiefly in the parts that could be separated by these operations; or only in the entire and undecomposed substance of the vegetable matter. By these labours the doctrines of the *materia medica* have been often corrected, and we have been thereby frequently taught not only to distinguish the different degrees of

the same quality in different bodies, but they have been particularly useful in directing the most proper pharmaceutical treatment of medicines, and have sometimes afforded an analogy for judging of the virtues of untried substances. With respect to their effect in ascertaining the virtues of medicines, I think they have done very little: for whether the medicinal virtue be found to reside in a volatile or a fixed, in a gummy or a resinous part, it will still require and depend upon experience to determine what that virtue is.

We are now arrived at a period when a number of different theories, successively or together, prevailed in the schools of physic; and which, according to the nature of their different systems, variously affected the state of the materia medica. Thus the Stahlians, in following the general principle of their system, always mysterious, have introduced archeal remedies, and many of a superstitious and inert kind; while at the same time, trusting to the *Auto-crateia*, they have opposed and rejected some medicines of the most powerful nature.

On the other hand, the mechanical physicians, by introducing the Corpuscularian philosophy; that is, the notion of the small parts of bodies acting upon one another, by their figure, size, and density, have in that manner endeavoured to explain the operation of medicines upon the fluids and solids of the human body; and have thereby introduced many false opinions concerning their virtues. It was the Cartesian physicians who first introduced this doctrine; but it was especially *Dr. Boerhaave*, who, by adopting it, contributed to extend it to the whole of medical writers. Even at this day it has not yet passed away; for I observe that a late author, Mr. Navier, and a living writer, Mr. Fourcroy, have continued to explain the operation of mercury by its specific gravity.

As it has happened, that ever since the introduction of chemical reasoning, physicians have generally considered the cause of diseases to be depending on the state of the fluids, so they have considered the operation of medicines chiefly as changing that state; and the theory still enters to a considerable extent into the doctrines of the materia medica. I judge this to be very improper, while the state of the moving powers, and of the various means of changing that, are as yet but little attended to. With respect to this, *Dr. Hoffman* admitted the general principle, and has this expression: "Demum omnia quoque eximiae virtutis medicamenta, non tam in partes fluidas, earum crasin ac intemperiem corrigendo, quam potius in solidas, et nervosas, earundem motus alterando ac moderando, suam edunt operationem: de quibus tamen omnibus, in vulgari usque eo recepta morborum doctrina, altum est silentium." Notwithstanding this, he himself, in treating of particular medicines, has for the most part employed the Corpuscularian philosophy, or a very ill defined chemistry, to explain the operation of medicines upon the fluids.

Another circumstance, still affecting and injuring the writings on the materia medica, is that of referring the operation of medicines to certain general indications; most of which have arisen from defects both of physiology and pathology, and are neither sufficiently explained nor well understood. They are for the most part of too general and complicated a kind, and ought to be reduced at least to more simple operations; and which, if it could be done with clearness, would not only prove one of the most useful methods of delivering the materia medica, but would almost entirely destroy the doctrine of specifics, which must otherwise continue upon the most mysterious and uncertain foundation. At present, many of the general indications to which the virtues of medicines are referred, are absolutely suppositious and false.

From having thus pointed out the many false sources from which opinions concerning the virtues of medicines have been derived, it will be evident that the writings upon the materia medica, being almost always compilations, must be full of mistakes and frivolous matters.

Whenever an author does not speak from his own knowledge and experience, but only informs us that a medicine has been said by former writers to have certain effects, or has been commended as curing certain diseases, he is merely a compiler, and upon a very uncertain foundation. It is impossible indeed for any man to treat of every article of the materia medica from his own experience; but surely, when it becomes necessary for him to quote the experience of others, he must be allowed to do so, but it must be with great skill and discretion in choosing his authorities; which, however, has been seldom done; and the neglect of it has filled our writings with a great deal of false experience.

Notwithstanding what I have now insinuated with respect to the imperfections to be found in the writers on the materia medica, it must be owned, that in modern times, more especially in the course of the present century, and even lately, the materia medica has received much correction and improvement.

The progress of philosophy has corrected many superstitious follies that were formerly intermixed with the doctrines of the materia medica. Chemistry has given us many new medicines, entirely unknown in ancient times; and this science, in its progress, has not only gradually corrected its own errors, but has taught us to reject many inert medicines which formerly made a part of the materia medica. It has taught us a greater accuracy in preparing all its peculiar productions, and to lay aside many of those operations with which it had amused the physician, and had imposed much useless labour upon the apothecary. In particular, it has instructed us how to make the combinations of medicines with greater correctness and propriety; and in all these respects has rendered

the whole of the pharmaceutic treatment of medicines more simple and accurate than it was before.

Chemistry has thus greatly improved the state of the *materia medica*, and has led physicians to a discernment that should reject that luxuriance of composition formerly so prevalent; and which, even at present, in most parts of Europe, is far from being sufficiently corrected. The reformation in this respect has not yet taken place to any remarkable degree, excepting in the northern countries of Europe, in Britain, Sweden, Denmark, and Russia. And if we look into the last edition of the Wirtemberg Dispensatory, which is of much authority in Germany, or into the *Pharmacopœia Generalis*, lately published by Spielman, we shall perceive that a great luxuriance of composition still prevails in Germany; and if we look into the *Codex Medicamentorum Parisiensis*, we shall be surprised at the many injudicious compositions, consisting of numerous and inert ingredients, which still prevail in the enlightened kingdom of France.

Having thus finished what it seemed proper to say of the general history of the *materia medica*, it may be expected, and will be proper, to give some particular account of the principal authors who have treated this subject. With respect to ancient authors, it does not seem necessary to say more than I have done above; and therefore what is farther to be offered shall relate only to the chief writers in modern times.

The writers of the 16th century, such as *Tragus* and *Taberna-montanus*, though frequently quoted since, do not deserve much attention, as they are merely compilers from the ancients, transcribing all their imperfections, and adding some mistakes of their own. If they offer some new facts, they are on a doubtful foundation, and often manifestly mistaken. As a specimen of the writings of *Tragus*, let us take the following, which I am ashamed to find quoted and repeated by the ingenious Mr. Geoffroy. On the subject of the *Polytrichum*, Mr. Geoffroy has these words: "*Tragus asserit illud vel solum vel cum Ruta muraria, vino aut hydromelite decoctum et per aliquot dies ex ordine potum, obstructions jecinõris solvere, morbum regium expellere, pulmonis vitia purgare, spirandi difficultate prodesse, duros lienis tumores emollire, urinam ciere, arenulas expellere, et mulierum menses suppressos promoveri.*" It might have been expected from the good judgment of Mr. Geoffroy, that he would have concluded this account as he had done one before, with saying, "*Ejus virtutes longe remissiores et debiliores esse, usus et experientia demonstraverunt.*"

The first writer of the 17th century whom I think it necessary to mention is, *John Schroeder*; and that not for his own merit, but for his having been so long considered as an authority in these matters. He has been quoted by the latest writers; and his very

words have been transcribed by Ray, Dale, and Alston; and an edition of his work, in the German language, was published in the year 1746: all which may be sufficient to show how slow the progress of discernment has been in the business of the *materia medica*.

In the year 1646, Schroeder published his *Pharmacopœia Medico-chymica*, which might have been entitled *Galenico-chymica*; and by uniting the Galenical and chemical pharmacy together in one book, he recommended his work to both the parties then subsisting. He is systematic, and as complete as the then state of science could well allow.

His chemistry, after the labours of Hartman, Quercetan, Libavius, and Angelus Sala, is more correct than it had been in the hands of Paracelsus and his immediate followers. He is, however, luxuriant in chemical preparations to the highest degree, and shows to what a wonderful number these had arisen in the course of a hundred years; but he is still fraught with all the folly, fanaticism, and extravagant commendation which had prevailed among the writers of that sect. The Galenic doctrine of Schroeder, though much followed afterwards, was in no better condition. He has followed the ancients in all their faults, and has repeated after them, without any reserve or even the smallest correction. He is still entirely in the Galenic system of the cardinal qualities and their different degrees, and is full in the doctrine of the elective qualities of purgatives. In following the ancients, he delivers the virtues of medicines by their general qualities and supposed powers, upon no proper foundation; and I might say, very often upon a false one.

The next writer to be mentioned is *John Bauhin*. His botanical merit is not to be taken notice of here; and I am only to speak of what in his *Historia Plantarum* he has written on the virtues of those plants which make a part of the *materia medica*. Upon this subject he was learned; and so diligent a compiler, that he may be read instead of all those who had gone before him. He has compiled, however, without any choice of authorities, and without omitting or correcting the mistakes that had before prevailed on the subject. He certainly did not deserve to be followed as he has been by Ray and others after him; and by no means deserves to be read now.

Not long after the work of John Bauhin, there appeared the *Botanicum Quadripartitum* of *Simon Pauli*; which has been so much respected by after writers, that it is proper to take some notice of it here. After I had looked into this writer, I was a little surprised to find this character of him in Etmuller: "*Simon Pauli, qui est elegans et simul tamen copiosus autor, atque cum judicio scripsit*;" and I was still more surprised by finding this character of him in Geoffroy: "*Simon Pauli, vir sane doctus et ingenuus*."

Pauli, indeed, who lived in the literary age of Copenhagen, had much erudition; but it was of the most frivolous kind, and without affording any correction of the imperfections and mistakes which had appeared in the writers whom he quotes, or showing any choice in the authorities he makes use of. He gives us often his own observation and experience: but the result of them is commonly so improbable, that I can give him little credit; and hardly in one of twenty instances in which Mr. Geoffroy has been pleased to quote him. His accounts are often delivered with such a trifling garrulity, that it is impossible to consider him as a man of good sense; and from much experience I have now formed an opinion, that from men of weak judgment, facts and pretended experience are not to be relied on.

Soon after Simon Pauli appeared *Georgius Wolfgangus Wedelius*, who, in a work under the title of *Amœnitates Materiæ Medicæ*, has attempted to reduce the subject to principles; but both his physiology and pathology are so imperfect, that I cannot find him to have thrown any light upon the business. He is still an abettor of the doctrine of signatures, as well as a believer in the power of amulets; and with regard to what he says further of the virtues of particular substances, he seems to be entirely guided by those who had gone before him.

There is hardly any notice due to *Emanuel Koenig*, who towards the end of the last, or soon after the beginning of the present century, published on all the parts of the materia medica: he also attempted to reduce the matter to principles; but he does it in a very imperfect manner, and there is not a folly in any foregoing writer that is not discovered in his work. In treating of particular substances he is a mere compiler, with as little judgment as any we have upon the subject.

Jean Baptiste Chomel began to read lectures upon the materia medica about the beginning of this century, and published his *Abregé de l'Histoire des Plantes usuelles* in 1712. The work does not appear to be a very valuable one; but there have been repeated editions of it: and the last by his son in 1761, shows me that much improvement in the knowledge of the materia medica had not made any progress in France.

Mr. Chomel, however, has his merit. He does not transcribe Schroeder as many others had done. He has entirely omitted the Galenical doctrine of the cardinal qualities and their degrees; and though he was an eleve of the great Tournefort, he does not repeat after him the explanation of the virtues of plants by the oils, salts, and earths, which the chemical analysis had seemed to point out.

Mr. Chomel has chosen, as I judge, a proper plan of arranging the subjects of the materia medica, according to the similarity of their virtues in answering the general indications of cure. In this,

however, he appears to be extremely imperfect. He has hardly upon any occasion explained these indications in a manner that can at present be admitted. Many of them seem to be absolutely improper; and most of them, if at all admissible, are too complicated to be employed with any clear instruction or even with safety to students.

Under the same titles he has often associated plants of very dissimilar, and even of opposite nature and qualities; and he has often inserted inert substances, that did not deserve to have a place any where.

Besides giving the general qualities, he mentions particular virtues which might not seem to arise from the general qualities. In this, however, he is not very fortunate, as he found it necessary for him to repeat after the writers that had gone before him. He does not indeed transcribe Dioscorides and Galen so much as others had done; but he has not omitted their opinions so often as with propriety he might. In quoting his modern authorities, he does not make the selection nor show the judgment that might be desired. Tragus, Tabernæmontanus, Matthioli, Zacutus, Schroeder, John Bauhin, Simon Pauli, Etmuller, Koenig, Boyle, and Ray, are not necessarily bad authorities: but they are certainly such when they deliver very improbable events; and their being quoted for such, frequently occurs in Chomel.

Chomel himself should be valuable, by his frequently reporting his own experience: but in a variety of instances he does this with respect to many substances which we presume to be very inert; and with respect to many, when the power ascribed, and the cures said to be performed, are very improbable. Perhaps, however, too much has been already said of this author; and it would be tedious to point out the many instances that might be mentioned of his incorrectness and mistake.

Stephen Francis Geoffroy, was a man of genius, and in many respects of good judgment, though this does not always appear in his writings on the materia medica. In his book on this subject, when treating of vegetables, he gives us an exact account of the analysis made by the direction of the academy of sciences. These are now not considered as of much use; but Mr. Geoffroy often attempts to explain the virtues of plants by the salts, oils, and earths which they seem to contain: in which, however, he gives little instruction; and as we have said above, the doctrine in general is false and ill founded.

In giving particular virtues, Mr. Geoffroy seldom does it from his own experience, and generally upon the authority of former writers; and in this he does not show much judgment, either in selecting those authorities, or in correcting either their extravagant commendations or their manifest mistakes. An example of this has been already given in one of the quotations he makes from

Tragus; and in many other places he appears equally injudicious in quoting from that author. I have mentioned above his character of Simon Pauli, and have given some reasons for my thinking it ill founded; but the best proof of this are the very quotations which Mr. Geoffroy makes from him. On the subject of vegetables, in almost every page Mr. Geoffroy quotes from Pauli; but seldom with much judgment. I can by no means admit, upon the authority of Pauli, that *Carduus benedictus* can heal cancers; or that the *Anonis* can be a certain remedy for a stone either in the kidneys or bladder. In repeating such accounts, Mr. Geoffroy appears to me injudicious; and he is certainly trifling in quoting Pauli for the use of distilled water of *Aparine*. It will hardly now-a-days be received upon the authority of Pauli, that the seed of the *aquilegia* has been of great use in the small-pox and measles, and still less that it has the power of assisting in the birth of children; and it gives no credit to the judgment of Mr. Geoffroy, that he confirms the virtues of this seed by his own experience. Mr. Geoffroy quotes the authority of Simon Pauli, for the *bellis minor* being highly useful in the cure of some desperate cases of *phthisis pulmonalis*; and it is a weak supplement to the authority of *Wepfer*, which, however, in this case is hardly sufficient. Upon the authority of Simon Pauli it is difficult to believe that the decoction of clove-julyflowers had served to free numberless persons from malignant fevers. To conclude, Mr. Geoffroy can receive no credit by repeating after Pauli, that the *Argentina*, by being put into the shoes of the patients, had proved useful in dysentery and all kinds of hæmorrhagy. I have now said enough of Mr. Geoffroy's injudicious quotations from Simon Pauli: and I could give many instances of his being equally injudicious with respect to the other writers whom he quotes; so that from this, and many other circumstances, his compilation may be judged to be of very little value.

Mr. Geoffroy in his own lifetime did not complete his treatise on the *materia medica*, leaving a great number of the indigene plants of France unmentioned; but his work was so much valued, that it was thought proper to give the public a supplement, which has been done in three *duodecimo* volumes. This indeed is executed very much in the manner of Mr. Geoffroy's own work; but notwithstanding the great name which in the preface is said to have reviewed it, I must take the liberty of saying, that in quoting authorities, the supplement is equally trifling and injudicious as the work of Mr. Geoffroy himself; so that upon the whole, it is of very little value.

In the list of writers on the *materia medica*, I cannot omit the *Synopsis Universæ Praxeos Medicæ*, by *Mr. Lieutaud*. The second volume of this work, which is entirely de *Medicamentis*, may be considered as a treatise of the *materia medica*; and though it be

as I cannot esteem, yet as being a late publication by a man of the highest rank in the profession, I think proper to take notice of it, as marking for the time the state of the materia medica in one of the most enlightened nations of Europe.

Mr. Lieutaud has distributed the subjects of the materia medica according to the general qualities by which they are adapted to the several indications arising in the practice of physic: but it must be observed, that the indications marked are for the most part ill defined, too general as well as too complicated, to convey any instruction to young practitioners; and they are truly exposed to all the objections I made to those of Chomel. Let us take, as an example, Mr. Lieutaud's title of *Febrifuga*. Under this title, of the substances enumerated, some are astringent, some are bitter, others aromatic; even the aloe and *gummi gutta* are inserted; and, on the same ground, fifty more might have been added. Very possibly most of the substances mentioned, may upon one occasion or other, be employed in the cure of fever; but they are certainly adapted to different circumstances of the disease: and as they are here huddled together, they can give no instruction, and may often mislead. From this article, and from many others, it may be observed, that Mr. Lieutaud might have given a more useful arrangement, by throwing together the medicines of similar qualities; but in this and every other enumeration in his book, he has given the several medicines in a promiscuous and very discordant order. Under the article of *Febrifuga*, the enumeration of his *em-poretica* proceeds in this manner: "*Radices taraxaci, fœniculi, pentaphylli, asari, gentianæ*;" and yet there can hardly be a more discordant set of substances.

These, however, are not the only faults of Mr. Lieutaud's enumerations; for in many instances, substances are enumerated, that do not at all belong to the title under which they are placed. Thus, under the title of *Antiputrida*, we find various animal substances; under *Refrigerantia*, there occurs *Cerevisia*; under *Astringentia*, there are the *Sophia chyrurgorum*, *Bursa pastoris*, and *Polygonatum*; under the *Stomachica* is put the *Iris Germanica*; and under *Emollientia* the *Senecio*. These are mistakes which perhaps may be considered as oversights *in opere longo*; but there are some general opinions, deliberately given, which cannot so easily admit of excuse. In almost every one of his enumerations, we find substances either absolutely inert, or of so little power, that for a long time past they have been entirely neglected in practice. Mr. Lieutaud, however, has found virtues in them which nobody else can discover. Such, amongst others, are the Distilled waters which he frequently prescribes; and which, notwithstanding his vindication of them, have been properly rejected from most of the dispensatories of Europe, excepting that of Paris.

The *Ebur*, *Cornu cervi præparatum*, *Cranium humanum*, *Ungula alcis*, *Pulvis bufonum*, *Cortex suderis*, and many others of like kind, if they were to appear in prescription, would, in Britain at least, effectually disgrace a practitioner. Some preparations formerly commended and in use, are now by many thought to be inactive and superfluous; as the *Cinnabaris factitia et antimonii*, the *Antihæcticum Poterii*, *Antimonium diaphoreticum*, *Æthiops mineralis*, and some others of at least disputed virtue; but Mr. Lieutaud retains them, and sometimes with much commendation of their virtues. In treating of particular subjects, he does not, like Chomel and Geoffroy, choose to quote his authorities; but he manifestly repeats the common-place accounts of former writers, and is every where liable to the censure which Galen applied to Dioscorides, of ascribing too many virtues to the same substance. Like many other writers, he imputes to several medicines very improbable effects. He mentions the *Fragaria* and *Dens leonis* as being remedies in *pollutionibus nocturnis*; the *Radix graminis* as being anthelmintic and lithontriptic; the *Bedeguar* employed for the cure of the bronchocele; *Coffee* as useful in preventing rickets; *Polypodium* in the cure of scrophula; and the *Euphrasia* as mending the *visus imbecillitas* in senibus: He mentions the *Avena* as proper *ad fugandum puerperarum lac*; and there can be nothing more remarkable than his account of *Cerevisia* bringing on strangury and a *gonorrhœa spuria*. He recommends many substances for healing internal ulcerations, for the most part an improbable effect; but his commending the *oleum terebinthinæ* for this purpose, seems to me a very dangerous doctrine.

Many other mistakes, inaccuracies, and even frivolous things, might be pointed out in this work; but it is believed that enough has been said to show that it cannot be consulted with any advantage, nor even with safety.

I have insinuated above, that Mr. Lieutaud's work might be considered as showing the state of knowledge on this subject in France at the time of its publication; and it certainly may be considered as showing it to be then in many persons of that country in a very imperfect condition: but it may be alleged that Mr. Lieutaud, who was little engaged in practice, who lived very constantly at Versailles, and had little communication with the literature of Paris, cannot be considered as giving a proper specimen of the learning and judgment which prevails among the many ingenious men who are to be found in that city.

Since the time of Mr. Lieutaud, there has been published at Paris a *Traité de Matière Medicale, extraite des meilleurs Auteurs, et principalement du Traité des Medicamens de M. de Tournefort et des Leçons de M. Ferrein*. This work I consider as superficial and incorrect, and in every respect unworthy of Mr. Ferrein, who was a man of learning and judgment, and, if he had been still in life, would never have countenanced the publication.

Some amends for this have been made by the publication of the *Precis de Matiere Medicale* par M. Venel. This is a posthumous work, and which perhaps the ingenious author, if he had lived, would have given himself in a more perfect state; but even as it is, the public are indebted for it to Mr. Carrere. It appears to me the most judicious writing that has yet appeared in France upon the subject; and the perusing it frequently recalls to my mind these two lines:

“Poets lose half the praise they would have got,
“Were it but known what they discreetly blot.”

Mr. Venel is remarkable for omitting the many idle things which former writers repeated after one another; and he has gone still further in correcting many of those prejudices which prevailed among the vulgar physicians and writers upon this subject. His chemistry and pathology are not always correct; but are always ingenious, and often probable; and if he had continued to study the subject, there is every reason to believe he would have rendered it more complete and perfect. Mr. Carrere, by his notes and several useful additions, has done a great deal to this purpose, and has rendered the work very valuable.

I proceed now to the writers of Germany. Of these, *Zorn*, as in the style of Linnæus compilatissima, and *G. Henry Behr*, as superficial and incorrect, are below criticism. *Buchner* and *Loesecke* are more respectable; but any instruction they afford on the subject of the *materia medica* is extremely imperfect.

The first writer of Germany who deserves our notice is *John Fred. Cartheuser*, the author of the *Fundamenta Materiæ Medicæ*; which is a writing of deserved reputation. The author has distributed the several subjects according to their sensible qualities, or to their more obvious chemical constitution; and by this he has very properly associated many substances by their natural affinities. This, however, does not go throughout; for under several of his general titles, such as those of his X. XIV. XV. sections, he has often associated substances of very dissonant qualities and virtues, while by the same distribution he has separated substances of very similar qualities, and therefore such as should have been with some advantage viewed together.

Upon particular subjects he has given, with great exactness, the chemical constitution of substances, according as they are volatile or fixed; as they are saline, oily, gummy, or resinous; and as these parts of bodies are obvious without any violence of fire applied. He has given this account from his own experiments; and by these as well as by those of Newman and of some others of a like kind, we are often well instructed in the most proper pharmaceutic treatment of medicines; but from experiments of that kind we seldom obtain much light with respect to the medicinal virtues.

As to the medical virtues of substances, Mr. Cartheuser is not

much wiser than others. He often attempts to explain the virtues of medicines by their chemical constitution, but in no satisfactory manner. His account hardly goes farther than that medicines are more or less active; but he does not at all explain the various modification or application of that activity. With respect to particular virtues, he repeats very much after preceding authors; and in general, like them, ascribes too many virtues to the same substance; so that he seldom gives any useful instruction.

It may be remarked, also, that he has employed general terms, which are not only ill defined, but also very often complicated, and sometimes altogether improper. As an example of this, and indeed of the extravagance of writers on the materia medica, here is Cartheuser's account of the virtues of zedoary: "*Vires medicæ hujus radices maxime quidem volatili principio oleoso camphorato adscribendæ sunt, valde nihilominus activitatem ejus fixa quoque principia resinosa gummea augent. Militat inter efficacissima tamen paullo calidiora medicamenta discutientia, sudorifera, alexipharmica, pectoralia, cardiaca, stomachalia, carminativa, anthelmintica et uterina: ac rite usurpata, eximium subinde auxilium in morbis exanthematicis, febribus malignis et catarrhalibus adfectibus frigidis rheumaticis, chachecticis et œdematosis, tussi et asthmate pituitoso, anxietatibus præcordialibus, dyspepsia, dysorexia, vomitu, diarrhœa mucosa, cardialgia et colica vere flatulenta, fluore albo, suppressione mensium chronica, partu difficili, et placenta uterinæ retentione præstat.*" *Cartheuser*, Sect. XIV. § 3. This is certainly extravagant; and that any instruction can be properly derived from it, I cannot perceive.

In 1758, the late learned and industrious Rud. Aug. Vogel published his work, intitled *Historia Materiæ Medicæ*. The subjects of the materia medica are here distributed according as they are taken from the leaves, from the roots, or from other parts of plants, which form no connection in the materia medica. He likewise distributes these subjects according as they are usitata, minus usitata, and obsoleta; and such a distribution might have its use: but that of Mr. Vogel cannot have much, as it is not taken from the nature of the substances themselves, as more or less fitted for use; but from the practice of a particular country, which cannot afford much instruction; for in Mr. Vogel's lists many are marked as usitata, which are not at all employed in Britain, and in his obsoleta many that are still frequently employed here.

In treating of particular substances, he repeats after others with no nice selection of authorities, nor with sound judgment on the nature of the subject. He renounces all principles deduced from reasoning; and holding he is to give only what experience has taught, he, in the first place, gives us a list of specifics; and I shall here mark several of these as specimens of his judgment and experience. Thus, *ad podagræ dolores leniendos, Bufa ustus; ad*

phthisin, *Plantago, bellis*; in ictero, *flores cheiri*; in alvi profluvius, *bolus Armena, chrystallus montana*; in sarcocele, *Sambuci flores*; in rachitide, *Sarsaparilla*; ad scabiem, *Hedera terrestris, Bonus henricus*.

To conclude, with respect to what may enable us to form a judgment of Mr. Vogel, let us take one other specimen from what he says of hirundo: "Integræ hirundini virtus tribuitur analeptica, et ad visus hebetudinem specifica. Pullum, si quis comederit, angina per totum annum non periclitari; servatum e sale cum is morbus urget, combustum carbonemque ejus in mulso contritum et epotum, prodesse refert e *Plinio Celsus*!"

Another German professor, Henr. Jo. Nepom. Crantz has given us a Treatise of the *Materia Medica et Chirurgica*. Here is a modern author, who in my opinion has done nothing to advance the knowledge of the *materia medica*. He does not indeed like Vogel disclaim principles; but those which he employs are seldom scientific and judicious. He transcribes from the ancients with as little discernment as those who had written before him; and although he has been at pains to collect the latest discoveries, or pretended discoveries, in the *materia medica*, yet it is seldom with any mark of his own judgment, either in chemistry or medicine; so that upon the whole his compilation is of very little value.

The late professor *Spielman* of Strasburg has given us *Institutiones Materiæ Medicæ*, in which he has distributed medicines according to their indications; and in reducing the indications to a lesser number, he has been more chaste than many who had gone before him. This brevity, however, has often rendered him obscure; and his general titles can hardly be applied to any use. In delivering the virtues he is commendably concise, but becomes thereby in many cases superficial. He is very fond of quoting Hippocrates and Galen, but does it in many instances where the authority of these venerable ancients is of little weight.

Besides the institutions, Mr. Spielman has published a *Pharmacopœia Generalis*; in the first part of which he has given a *materia medica* full of superfluities; and with respect to the virtues of the substances in use, he is superficial and incorrect. In the second part, or the proper *pharmacopœia*, he has also much superfluity; and by the luxuriancy of composition which he almost everywhere exhibits, discovers to me an absolute want of all discernment in the business of the *materia medica*.

To make amends for the errors and defects of preceding writers, the public have now received the *Apparatus Medicaminum* of the very learned and ingenious professor *Murray* of Gottingen. This work is not yet finished; but it promises, when concluded, to be the most complete and perfect that has ever appeared upon the subject. In so far as it has yet proceeded, the author with great judgment and medical discernment has, from former writers, and

more especially from those of latest date, collected every thing which deserved to be repeated. He every where discovers an intimate acquaintance with all the writers on the subject, and always makes a judicious selection of what they afford. By his distributing the vegetable substances according as they belong to the several natural orders marked by the botanists, he has associated the substances of similar qualities and virtues, in a manner that may be of great advantage to students.

This author who is a native of Sweden, does credit to his country, and has deservedly received honours from it; but from his present situation at Gottingen, I have classed him amongst the writers of Germany, and shall next proceed to mention those who more strictly belong to Sweden.

Of these the first to be taken notice of is the very respectable *Carolus a Linne*, from whom we have, as it is now published by Schreber, a complete treatise of the *materia medica*. Before offering any opinion respecting this work, it will be proper to remark, that in another treatise this learned author has shown a very sound judgment. What I allude to, is the *Censura Simplicium*, published in the fourth volume of the *Amœnitates Academicæ*; in which the *Excludenda* seem to me every where proper and judicious, correcting in many instances the errors and futilities of former writers. In his list of *Addenda*, indeed, as well as in his *Plantæ Officinales*, there are many articles which are doubtful; but it is not necessary to point them out here.

After Linnæus had, in the *Censura Simplicium*, shown so much judgment in rejecting the inert and superfluous, it is rather surprising to find so many of these substances still mentioned in his *Materia Medica*, which he himself marks as superfluous, and which ought to have been omitted altogether. Besides, nothing can be more frivolous than what he has given respecting the substances taken from the animal and mineral kingdoms; for at least three-fourths of them neither are at present, nor in any shape deserve to be employed.

The subjects of the vegetable kingdom are distributed according to his own botanical system; and as that in several places admits of natural orders, it is in so far useful: but this does not go the length of rendering the distribution in general proper. Upon particular subjects, he seems disposed to ascribe too many virtues to every substance, both in the articles of *vis* and *usus*. In the latter article there may be information to persons well acquainted with the subject; but in many instances it is doubtful, and, in my opinion, very frequently ill founded. With respect, however, to the whole that Linnæus has delivered on the *materia medica*, from vegetables, our attention is very much superseded by the work given us on the same subject by his scholar *Bergius*.

The *Materia Medica ex Vegetabilibus*, by *Petrus Jonas Ber-*

gius, is a work truly of great value, and very much deserving our notice. It is precisely upon the plan of Linnæus; and therefore the same observations we made on the distribution of that author may be applied to it. We have here, however, a very valuable addition to Linnæus in the article of *Forma*, which gives a very full and very exact description of the substances used in the *materia medica*. Where the substances are used in their recent state, the description is of all the several parts of the plant; which, I believe, is every where exact, and may be useful, though perhaps it was not always necessary. But with respect to those substances which we know, and use only in their dried state, the descriptions of Bergius are very proper, and as being particularly correct, must be very useful.

In the article of *Proprietas*, which comes in place of the *Qualitates* of Linnæus, Bergius has made a great improvement, in giving the sensible qualities of the substance as used in medicine, both in its recent and dried state, and leads us often to determine how far medicinal virtues are connected with the sensible qualities.

In the articles of *Vis* and *usus*, Bergius, in ascribing virtues, is much more chaste and correct than Linnæus: but indeed the manner of treating the subject is in both writers liable to doubt and obscurity, and neither very fit nor sometimes perhaps very safe for the purpose of informing students.

After these remarks on the work of Bergius, I must add, that he has given a very valuable addition in the observations which he has subjoined to almost every particular subject. In these he has communicated much useful instruction with respect to both the medical qualities and the pharmaceutic treatment; but I can say no more of these observations here than to recommend them earnestly to the reader's attention.

It now only remains to mention the British writers, who have been always very few deserving our notice. Of *Mr. Ray* enough has been already said; and *Dr. Hale*, as being chiefly a transcriber of *Schroeder*, has made no improvement with respect to the medical virtues. *Dr. Alston*, my late worthy colleague, has given a treatise that must be supposed to have been composed long before its publication. It is not without many faithful observations derived from his own experience; but his transcripts from *Schroeder*, and others of no better authority, render his work very tedious and of little importance.

We have had a bulky work on the subject from the well-known *Dr. Hill*. It is merely a compilation, without selection or judgment; and neither in that work, nor in his particular dissertations, so far as he refers to his own experience, is he received in this country with any credit.

The only English work that does any credit to the country, or has made any improvement in the *materia medica*, is the

Treatise of the late *Dr. Lewis*, and especially as published and judiciously enlarged by *Mr. Aiken*. As *Dr. Lewis* had undertaken to treat of all those subjects which had appeared in the lists of the London and Edinburgh Dispensatories, so he had from this last introduced a great many which did not deserve a place; and I think *Mr. Aiken* has with great propriety marked out those which have been since expunged by the Edinburgh College themselves. When these articles are thrown aside, the rest of *Mr. Lewis's* work is one of the most judicious that had at that time appeared on the subject. Not to mention his correct description of drugs, and his useful experiments in their treatment, by different menstruums, he is very chaste in ascribing virtues, and in repeating from former writers; and from his own experience, as well as that of the most skilful London practitioners, he gives a sounder judgment of the real virtues of substances than had been given before.

There yet remains another British writer to be mentioned, and that is the late worthy *Dr. Rutty*, of Dublin, the author of the *Materia Medica Antiqua et Nova*. He tells us it has been a work of forty years; which to me, who think there is little to be learned from the ancients, is no great commendation. He has compiled very faithfully from the ancients, not even omitting *Galen's* account of the cardinal qualities and their degrees; and as he has repeated all the follies and imperfections that I have alleged to be found in the ancients, I cannot find this part of *Dr. Rutty's* work to be of any use; and with students it may often mislead. *Dr. Rutty* has given a very large list of the *materia medica*: but as in that list he has inserted a great number of substances absolutely inert, or nearly so; as he has inserted many superfluous, as having in a lesser degree the same qualities with others, and many which, by their being inert or superfluous, have now become obsolete; his work is no way useful in proportion to its bulk. When he treats of medicines which are still in use, he gives us some observations of his own; but for the most part he repeats the common-place accounts with no singular judgment, and generally ascribes too many virtues to the same medicine.

I have thus endeavoured to give a History of the *Materia Medica*; and have taken the liberty of offering the judgment which I have formed of the chief writers who have written upon it. As there has occurred more occasion to blame than to commend, it has been a disagreeable task; and I am afraid that the public opinion may be offended by my disparagement of the Ancients. I deemed it proper, however, to hazard this, because, I trust, in the progress of this work, the judgment I have offered will be fully justified; and it seemed necessary to inform students from whence they might most properly and safely draw their instruction, and be put upon their guard against opinions that might deceive and mislead them.

A
TREATISE
OF THE
MATERIA MEDICA.

INTRODUCTION.

BEFORE entering upon the consideration of particular medicines, it may be proper to treat of what in general relates to the operation of all of them. There are certain principles which have a reference to the whole; and by explaining these in the first place, we shall not only save afterwards much repetition that might otherwise have been necessary, but, by having laid down these general principles, it may be possible, in a more simple and clear manner, to explain the operation and virtues of particular medicines.

It is the more requisite to enter upon the consideration of those general principles, as there are several to which physicians do not appear to have given the attention which seems to be necessary. Besides, it is well known, that with respect to the justness and propriety of many of the principles which have been adopted, physicians are very far from being agreed: and I therefore deem it necessary to offer my peculiar sentiments with respect to many of those principles that have been before assumed, and more necessary still to explain certain new principles which I shall think it requisite to employ. In the last, indeed, I perhaps hazard a great deal: but every part of science is still imperfect, and must for ever remain so, if attempts be not made to improve it.

With these views, it is to be remarked, in the first place, as a principle commonly assumed upon this subject, that few or no medicines act upon the living human body in the same manner, and with the same effects, as upon inanimate matter; and it is now well known, that the operation and effects of substances applied to the living human body, are for the most part altogether different from the effects of the same application to the dead body. Few indeed, or none, of these substances which are considered as medicines, have any effects at all upon the dead body; and therefore, assuming this as a principle, when hereafter I shall have occasion to speak of the action of substances upon the body, it must be constantly understood to be their action upon the living body only; and at least with very few exceptions, which shall be taken notice of when occasion requires.

Having assumed this principle, it must be obvious, that, in order to consider the operation of medicines in general, it will be proper to begin with explaining the peculiar circumstance of the human

body, by which it is thus capable of being acted upon in a peculiar manner by other bodies applied to it; and it will be also requisite to inquire concerning the manner in which the general operation of medicines may be variously modified, according to the different states and circumstances in which the human body may be upon different occasions.

CHAPTER I.

Of the Action of Medicines upon the Body in general.

IN these days, it is hardly necessary to show that the action of other bodies upon the human, is chiefly by the impulse of these bodies upon the extremities or other parts of the nerves of the human body; in consequence of which, a motion is propagated from the place of impulse along the course of the nerves, to their origin in the brain or medulla spinalis; and that, upon such occasion, there does for the most part arise a *sensation*. This again generally gives occasion to a *volition*; whereby a motion is produced, which being determined along the course of the nerves into certain muscles, or moving fibres, the action of these, as well as the various effects which their action is suited to occasion, are in consequence produced.

This is the general idea of the connection of the human body with the other parts of nature; or of the manner in which the human body is acted upon by other bodies, and in its turn acts upon these. That condition by which it is fitted to have peculiar effects produced in it by the action of other bodies, is called its *Sensibility*; which seems to be lodged in every part of what we can discern to be parts of its nervous system: And that condition of the body by which certain parts of it are fitted to have certain motions of contraction excited in them, either from a communication with the nervous system, as expressed above, or by an impulse directly made upon these parts themselves, is termed the *Irritability* of the body; which seems to exist only in the muscular or moving fibres, probably of a peculiar structure suited to that purpose.

From all this, we come at this conclusion: That the peculiar effects of substances in general, or of those substances in particular which we call *medicines*, when applied to the human body, depend upon their action upon its sentient and irritable parts.

It is, however, to be remarked here, that the action of substances in producing their effects, is not universally, as insinuated, above, by the intervention of sensation and volition; for these effects are often produced without either the one or the other. At the same time it is probable, that in all cases the effects pro-

duced by the action of other bodies upon the human, although not accompanied with sensation, yet are produced by their action upon the sentient parts; and it is likewise probable, that in the case of action unaccompanied with any volition, both the action and its effects, depend either upon the application of those bodies directly to the irritable parts, or upon their application to sentient parts, which determine motions into those very nerves wherein motions are commonly excited by volition. Upon the whole, it is sufficiently probable, that the peculiar action of medicines depends upon the sensibility and irritability of the human body; or, in other words, that it universally depends upon motions excited and propagated in the nervous system. These therefore, are the conditions of the living body which we were engaged to explain. What is the nature of the matter in which these motions take place, or in what manner it is inherent in the nervous system, is not well known: but we think it may be justly held as existing, and may speak of it under the appellation of the *nervous power*. As it appears only in the living, and disappears entirely in the dead state of the body, it may be otherwise properly enough termed the *vital principle*.

It does not seem necessary to explain fully here, the various laws by which the motions of the nervous system are regulated and governed: but with respect to the operation of medicines, this in general is to be observed, that as there seems to be a possible communication of motion from every part of the nervous system to every other part of it; so medicines, though applied to one small part of the body only, do often in consequence of the communication mentioned, show their effects in many other parts of the body.

This sympathy or consent, as it is called, of the several parts of the body is in general very well known to physicians; and I shall have occasion frequently hereafter to take notice of it, in mentioning the effects depending upon it, and the laws by which it is governed. At present I am to prosecute the consideration of it no farther.

Having now considered the action of medicines in general upon a living body, it may in the next place be observed, that as the effect of the action of one body upon another does always depend, partly upon the general operation of the body acting, and partly also upon the particular circumstances of the body acted upon; so it is well known, that as the human body is in several respects considerably different in different men, and even in the same person at different times, so the operation of medicines upon it must be variously modified according to the different circumstances in which the body may happen to be, and that, either throughout the whole of life in different men, or upon particular occasions in the same person.

It is therefore necessary, before going further, to consider those

differences in the state of the human body which may occur and give occasion to a difference in the operation of medicines upon it. We shall, therefore, proceed to consider those constitutional differences, which take place throughout life, under the title of *Temperaments*, this being the appellation under which these diversities are commonly mentioned.

SECT. I. OF TEMPERAMENTS.

IN attending to the great number of circumstances in which the bodies of men may be different from one another, it is scarcely possible to enumerate every particular: but it has been at all times presumed, that a great number of these circumstances are commonly combined together in the same person; and that frequently one man shows a combination of circumstances not only different, but sometimes of an opposite kind to that of another. Such combinations, upon a particular supposition with respect to their causes, the ancients named *temperaments*; and the term has continued to be employed in the schools of physic from the most ancient to the present time.

Abstracting from all theory, we continue to employ the same term to denote a combination or concurrence of circumstances which happens in certain persons, but which in several respects is different from the combination that happens in certain others. Upon this footing, I believe the ancients distinguished what they called the different temperaments of men: for it is probable that they distinguished them by actual observation; but very soon they formed a theory with regard to them, from whence they formed appellations which have continued to be applied to them ever since. The appellations indeed have been continued, though the theories which laid the foundation of them have been long ago exploded; and the moderns have neither by observation extended the ancient distinctions, nor, though they have often attempted it, have they ever given, so far as I can judge, any happy explanation of the causes or foundation of the distinctions they have so generally adopted. I believe it will be generally allowed, that this part of medical doctrine is still in an embarrassed and undetermined state.

In treating the subject, philosophy would require that I should in the first place distinguish temperaments, by marking the external and observable circumstances which are found with some steadiness to be commonly combined together: but this I find a difficult task, and what my observation has not been so extensively applied to as to enable me to perform in the manner I would wish. I must therefore proceed in another way; and shall endeavour to consider those circumstances of the internal state of the human

body which may give occasion to a difference in the state of the functions, and even in the external appearances which distinguish different men.

These circumstances may, I think, be referred to five general heads according as they occur, *1st*, In the state of the simple solids; *2dly*, In the state of the fluids; *3dly*, In the proportion of solids and fluids in the body; *4thly*, In the distribution of the fluids; and *5thly*, In the state of the nervous power. With respect to each of these heads, I shall now offer the best remarks, and give the best explanation, that the present state of our science seems to me to admit of.

ARTICLE I. *Of the Simple Solids.*

Whether these be in certain parts of a fibrous, or if they be entirely of a cellular texture, it is not necessary to determine here. It is enough for our purpose, that they are at different times of a different degree of density and firmness; this particularly appears in the progress of life, when from an almost fluid state they are gradually changed into a more dense and solid substance.

The ancients marked the difference of temperament by the colour and strength of the hair of different persons; and many experiments shew that the strength of the hair does for a great part of life follow the density of the simple solid in other parts of the body. *Dr. Brian Robinson*, in his *Treatise of the Animal œconomy*, has by many experiments clearly shown, that the density and strength of the hair increase with the age of the person; and therefore, that the state of the hair is correspondent to that of the simple solids in other parts of the body. It is true, indeed, that the state of the simple solid may in different persons be considerably varied by the difference of diet, exercise, climate, and other like circumstances: but at the same time, as the state of the solid seems to be often an hereditary condition, and as it frequently shows itself very early in life, before the circumstances just now mentioned can be supposed to have modified its state; so it is highly probable, that the state of the simple solid depends upon the difference of the original stamina of the body; and as that difference will proportionally prevail throughout the whole of life; so, notwithstanding the circumstances in the manner of living, it will always have its share in producing a difference in the state of the solid in different persons at the same period of life.

Whilst, therefore, a difference in the state of the solid must occasion a difference in the whole of the state of different persons; so it must be admitted, that a difference in the state of the simple solid must at all times have a share in distinguishing the temperaments of men.

It being, however, farther probable, that the state of the moving

fibres is in some measure modified by the state of the simple solid; so likewise it is probable, that the simple solid, according to its state of density and elasticity, must have a great share in determining the strength or weakness of the moving fibres, and consequently of the whole system, so as in this manner especially to have a very powerful influence in distinguishing the different temperaments of men.

It here merits particular notice, that as the state of the simple solid is for the most part likely to be proportionally the same throughout the whole of life; so there is reason to believe that, from incidental and sudden changes in the state of the simple solid, diseases will seldom arise. This indeed may possibly be affected by various incidental causes: but they are either such as very rarely occur, or such as cannot be applied at once to a considerable portion of the system; and which, for the most part, take effect only when applied for a great length of time. I am persuaded, therefore, that those sudden changes which frequently occur with respect to the debility and strength of the system, cannot be imputed to changes in the state of the simple solid, which cannot suddenly take place, but must be imputed to changes in the state of the moving fibres, *quem facile mille res turbant*. Dr. Boerhaave gave little attention to the circumstances last mentioned; but whoever studies this subject, will perceive that the illustrious Professor's doctrine *de fibra laxa vel rigida*, as explaining the causes of the *fibra debilis vel fortis*, will not apply so extensively as he has supposed: and consequently, that those powers of changing the state of the simple solid which have been imputed to internal medicines, are seldom to be regarded; or at least never without a number of limitations, to which little attention seems to have been hitherto paid.

ARTICLE II. *Of the State of the Fluids.*

From the earliest accounts of physic with which we are acquainted, it appears, that from the most ancient times down to the present, physicians have been attached almost entirely to the study and consideration of the fluids; and from the supposed state of these, have endeavoured to explain the phenomena both of health and sickness. In this, however, they appear to me to have been unfortunate: for, not to mention the imperfection and falsehood of the many speculations, both of Galenists and chemists, which have formerly prevailed on this subject, I would venture to assert, that the doctrine concerning the fluids is still the most imperfect part of our physiology. Every thing systematical that has been delivered upon it, till within these last forty years, may be totally disregarded: for it is only within the period now mentioned that we have acquired any distinct notions of a fundamental doctrine; or in other words, of the state of aggregation in the mass of blood. Even with respect

to this last, there still remains much doubt and obscurity; but notwithstanding these difficulties I shall endeavour to consider what may be said with regard to the state of the fluids in different persons.

It may now safely be held, that the mass of blood, or that portion of our fluids which fills and flows in the red vessels, and from which all the others seem to be derived, is every where a heterogeneous aggregate, consisting chiefly and especially of three parts: to wit, red globules, gluten, and serosity: And if it should be alleged that there are other matters present, as perhaps there may be, I shall in the sequel examine the question; but in the mean while, I believe they may be considered as portions of the three principal parts now mentioned.

With respect to these principal parts, it is sufficiently probable that they are in a different proportion in different persons: and this different proportion may therefore have a share in giving some difference of temperament; although in what cases this takes place is not easily to be ascertained.

That the red globules may be in different proportions to the whole mass, we discern very clearly from several diseases, in which their quantity is evidently and considerably diminished; but what may be their proportion in persons in health, or in what manner that proportion is connected with the other circumstances of health, is by no means ascertained by any proper experiments. From several observations on animals whose vessels are easily subjected to microscopical examination, it appears that the proportion of red globules is greater or lesser according to the greater or lesser quantity of the aliment or nourishment the animal receives. It is very probable, therefore, that the quantity of them in the human blood may be affected by the same circumstances: But still this does not aid us in determining the question with respect to persons in health, who take in nourishment in proportion to their several bulks; and whether the effect of nourishment be determined by the quality, as well as by the quantity, is not ascertained. It appears to me that, if at all, it is not affected much by the quality of nourishment, unless the difference of that quality be very considerable. It appears also, that the proportion of red globules is as great in the animals living entirely upon vegetable aliment, as it is in those who live entirely upon animal food, or as it is in man, who lives partly upon the one and partly upon the other.

Many attempts have been made to estimate the proportion of the quantity of the crassamentum to that of the serum in the extravasated human blood: but hardly any of the experiments yet made afford a certain conclusion. The apparent proportion of the two masses is very fallacious; being very much varied by the circumstances which determine the concretion of the cruor to take

place sooner or later, and by the time which is allowed to pass from the time of concretion to that at which the proportions are examined. It is now indeed well known, that these circumstances vary the separation which takes place; and it does not appear to me, that in any of the estimates which have been made, due attention has been given to the effect of those circumstances. When *Dr. Haller*, in his *Primæ Lineæ*, paragraph 138, gives this judgment; "In massa sanguinea media pars, et ultra, cruoris est: in robore valido serum minuitur ad tertiam partem; in febre ad quartam et quintam reducitur; in morbis a debilitate increscit;" I am persuaded that he had judged entirely from the quantities that appear separated in ordinary blood-lettings, and had not attended to the different quantities that appear in these according to the different circumstances of the blood-letting. In cases of rheumatism, I have seen the crassamentum not equal to a third part of the serum surrounding it; and other cases, where the serum did not separate from the crassamentum, to the amount of a fourth part of the whole mass: and from attending to the circumstances of the blood-letting, I have been able to foretel what, in twenty-four hours after, would be the condition of the separation. But even supposing we had a more exact estimate of the serum with respect to the crassamentum, or, in other words, of the red globules and gluten taken together, it still remains undetermined what proportion these two last-mentioned matters bear to one another; and consequently it is not yet ascertained what is the usual proportion of red globules in the blood of persons in health, nor how far it may have a share in producing a peculiar temperament.

With respect to the gluten of the blood, considered by itself, it is equally difficult to ascertain its proportion either to the whole mass or to the several parts of it. It seems to me to be determined that the gluten, whether combined with the red globules in the crassamentum, or spontaneously separated from the other parts, is the same kind of matter with that which is dissolved in the serum. In what proportion, however, this last may be, is by no means accurately determined. There is reason to believe that the serum is always a saturated solution; but at the same time it is probable, that the solvent power of the serosity may be greater or less upon different occasions; and therefore we still want experiments to ascertain the proportion of the whole of the gluten to the rest of the mass. It may readily be admitted, that in healthful bodies, both the red globules and the gluten may be more or less, according to the quantity, and in some measure according to the quality, of the aliments taken in during a given time: but this will hardly enable us to determine what is the proportion in the healthful bodies of different persons; and consequently what share they may have in giving a difference of temperament. It may be presumed, however,

that with respect to the serosity, the proportion of red globules and of gluten taken together, will be greater or less according to the force of the digestive and assimilating powers in each person; and that these again will be according to the general strength or weakness of the system. The proportion of the several parts of the fluids, therefore, may be different in different temperaments; but still this will not of itself produce that difference.

It remains to consider the third portion of our mass of blood; and that is, the serosity; with regard to which, the ascertaining its proportional quantity is equally difficult. It must be equally so with respect to the ascertaining the proportions of the crassamentum and the serum; because the proportion of serosity may be presumed to be the same with that of the serum: and therefore, till the latter can be more exactly ascertained than it has yet been, we must endeavour to do it by considering those causes which may be supposed to produce in greater or lesser quantity the matter contained in the serosity.

In attempting this, we shall lay aside a consideration that might readily present itself, and which is, that of the quantity of liquid taken into the body. This certainly does occasionally increase the quantity of serosity: but as I believe the excretions in healthful bodies are always increased according to the quantity of liquid matter present in the blood-vessels; so I suppose that a greater quantity of liquid occasionally taken in, will soon pass off by the excretions, and therefore will occasion no steady difference in the proportion of serosity in the healthful state of different persons.

We must therefore seek for some other cause of the difference in the proportion of the serosity. With this view, it appears, that the digestive and assimilating powers of the animal æconomy are fitted to prepare, from the aliments taken in, a fluid suited to the purposes of that æconomy, particularly to the nourishment of the solid parts of the body; and such fluid, whilst in a condition fit for its purpose, we presume to be bland, mild, and nowise noxious and hurtful.

At the same time, it is probable that these same fluids are not long stationary in that condition; but in consequence of a certain process constantly going on, are changed into such a state, that if the change was to go too far, and the changed fluids at the same time to be retained in the body, they might prove to it extremely noxious, and even pernicious. It is the change now mentioned that we suppose to produce the serosity, which, although suited to some purposes of the æconomy, is yet at the same time necessary to be constantly thrown out of it; and is therefore what affords the ordinary excretions. From this last circumstance of the serosity being fitted in proportion to its quantity to be thrown out by the excretions, we presume that its proportion in the whole mass

is seldom for any length of time to any degree of excess. Still, however, its proportion may be different in different persons; and this difference may have a share in giving a difference of temperament. It may be alleged, indeed, that the animal process which produces a serosity may be in different degrees of force in different persons; and consequently that the serosity may be produced more or less quickly, as well as be of a more saline quality, in one person than in another: so that in this manner, by a difference in the quantity and in the quality of the serosity, a difference of temperament may be produced. That this is possible, cannot be denied; but I do not know the circumstances in which it takes place, nor the external appearances whereby it may be discovered.

It has indeed been commonly enough supposed, that the blood is in a more saline state in some persons than in others; and this may be the case, but we have no proper experiments to ascertain the quantity or condition of the saline matter in the blood. It has been imagined, that the saline state of the serosity may be discovered by certain appearances on the surface of the body: but with respect to these, the conclusion is fallacious; because it can be rendered probable, that these appearances often depend more upon the state of the skin itself, than upon the state of the fluids passing through it.

Upon the whole of this inquiry into the state of the blood with respect to its aggregation, or with respect to the state and proportion of the several parts which compose it as an aggregate, it seems not only to be uncertain how far these circumstances give a difference of temperament; but, on the contrary, it seems probable, that they never do so in any considerable degree.

Notwithstanding all this, ever since chemical reasonings have been admitted into our physiology, that is, ever since the time of *Paracelsus*, physicians have considered our fluids as distinguished by the state of their chemical mixture, either in the whole of the mass of blood, or in the several parts which compose it as an heterogeneous aggregate. It is, however, in the latter view only, that is, with respect to the several parts, that we can chemically consider the subject; and here it will be readily acknowledged, that till very lately, much frivolous, hypothetical, and false reasoning has prevailed in the chemical doctrines respecting the nature and state of our fluids. Even at present, physicians have hardly come to be sufficiently chaste in avoiding such hypothetical doctrines; and however confident they have been in their chemical reasonings, I am unable to find any thing either clear or certain upon the subject. Not to mention how little we have yet learned of the nature of vegetable or animal substances from their chemical analysis, it is enough to say here, that with respect to some part of the mass of blood, it is by no means ascertained, either

that their chemical mixture is upon different occasions any wise changed, or what change is produced, or in what manner such change is effected. This may be very confidently asserted with respect to the red globules; the mechanical or chemical properties of which are neither of them clearly ascertained; and we neither know how they are formed or produced, nor in what manner they may be chemically changed.

With respect to the gluten, I am disposed to make the like assertion: for it appears to me, that we neither know how it is formed from our vegetable aliment, nor what is precisely the state of its mixture; and therefore we cannot clearly say, *a priori*, how it may be chemically changed. I do not indeed know of any observations which ascertain its being in any case changed in its sensible qualities. There are indeed cases in which its viscosity and force of cohesion seems to be considerably diminished; but different explanations of these phenomena may be offered: and however they may be explained, the phenomena seems to take place only in more evident morbid cases: so that we have no just grounds for asserting that any such difference takes place in the temperaments of different men in health. It has indeed been commonly supposed, that the density and viscosity of the mass of blood is different in different persons even in a state of health, and more certainly in the case of disease; and this has been imputed either to the greater proportion of gluten in the mass, or to the greater viscosity or force of cohesion of the gluten that is in due proportion present: but neither the one nor the other supposition has been ascertained by proper experiments. Some experiments, indeed, as those of Dr. Browne Langrish, have been offered for the purpose; but they are evidently frivolous and fallacious.

I have said above, that the proportion of gluten in the blood may be increased by the quantity of aliments taken in, and by the vigour of the system in preparing and assimilating these: but it is sufficiently probable, that the proportion of gluten will be suited to the vigour of the system, and therefore produce no morbid state; and although it should have some share in giving a difference of temperament, it will not do this as considered by itself, but only as accompanying the other circumstances of more power in the system.

I cannot dismiss this subject without observing, that the supposition of a preternatural spissitude of the mass of blood, or, as it may be expressed, of a lentor, being a frequent cause of disease, has had a great share in almost all the modern systems of pathology; but I allege that it has been for the most part hypothetical; and has hardly, so far as I know, in any case been ascertained as a fact. I am disposed to maintain, that the supposition is for the most part improbable. The functions of the æconomy, depending

upon the constant motion of fluids through many narrow canals, require that those fluids should have a very great fluidity; and accordingly Nature has, for this purpose, provided that a pure water should always make a very great part of the animal fluids. It is also certain, that those parts whose particles might be disposed to unite together, and to form impermeable masses, are for the most part held in a state of solution, and in a very fluid state; or if there are certain parts which are only in a diffused state, these are in very small proportion to the entirely fluid parts: and while the heat and motion of the whole continue, the cohesive matters are kept in a very minutely divided state, and diffused amongst the more fluid parts; and there is not any evidence of their separation from those fluids but in consequence of stagnation. There is therefore, little foundation for the supposition of a preternatural spissitude prevailing in the mass of blood, or of its proving commonly the cause of disease: And although what I have now said be not suited directly to my present purpose of explaining the difference of temperament, yet it has some concern in it; and in an introduction to the consideration of the operation of medicines, cannot be improper.

But to return to my subject: I have now endeavoured to show, with respect to the red globules or gluten, that from the consideration of their chemical mixture, we can obtain very little knowledge towards the distinction of temperaments. It may, however, be expected, that by means of chemistry we may obtain more from the consideration of the serosity; but how far we can go even in this matter, is to me very uncertain. It is now known very well that the serosity of the human blood is a watery fluid which holds dissolved in it, besides a quantity of gluten, a peculiar salt which is hardly known, or at least is not distinctly perceived to be in any other part of nature besides that of animal bodies. We know also, from the excretions which we presume to be afforded by the serosity, that there exists in it also a quantity of oily matter; but of what particular nature that is, or in what proportion it is present, or in what manner it is combined with the other parts, we do not know with any precision; and therefore cannot say in what measure the consideration of this oily part may serve to ascertain the different state of the fluids in the different bodies of men in health.

We may, I think, neglect the consideration of the oily part of the blood; but the saline part may seem to deserve more attention. There is ground to believe, that besides the peculiar saline matter above mentioned, there are a number of other saline matters present in the serosity; but of what nature precisely, or in what proportion, remains unknown. To give an example of this, we know now that there is in the urine of every person, probably derived from the serosity, an acid, that upon certain occasions gives a con-

cretion in the urinary passages, and which, separated from the urine, puts on the appearance of an earthy or stony matter. This, however, has been learned only lately from the analysis of such urinary concretions as have become a disease; and the discovery, while it now enables us to correct some parts of our system, serves at the same time to shew how ignorant we were with regard to the state of the human fluids.

From these considerations of the several matters which we can perceive to exist in the mass of blood, it will appear that there is little ground for distinguishing the different temperaments of men by the different state of their mass of blood. It is indeed very possible, that a different state in this respect may take place in different men; but to what degree, or by what external marks it may be perceived, in ascertaining either the one or the other, physicians have hardly yet gone any length.

Without entering thus into the consideration of the different states of the serosity, it may be imagined there is a grosser view, that may be taken for distinguishing the different state of the fluids in different persons.

There is in the human body, as living always in part upon the vegetable aliments, a power whereby these aliments, after being some time in the body, are considerably changed in their nature and qualities, being changed into animal fluids; which are in several respects considerably different from the vegetable matters that were taken in. How this change is effected we do not exactly know; and the only circumstance that tends somewhat towards the illustration of it, is, that a change of vegetable matter, nearly analogous to this which happens in the human body, is made by its being subjected to putrefaction: and though we cannot distinctly perceive in what portions of the fluid, more especially in what manner, or to what degree, this is carried on in the body; we may pretty safely conclude in general, that the animal process is a part of the putrefactive fermentation. At the same time we observe, that after the animal process has brought the aliments into that state which is suited to the purposes of the animal œconomy, or into the proper state of animal fluids, these are not long stationary in that condition, but are constantly advancing towards a putrid state; and that these degenerating and degenerated parts are what chiefly form the saline or earthy ingredients of the serosity, which, with a part of the fluid, are constantly passing out of the body by the several excretions.

In this view, we can perceive that the animal fluid may in its composition be more or less prone, and more or less advanced towards the putrescent state; and that by these circumstances the fluids may be different in the consistence of the whole mass, or in the chemical qualities of the serosity: but till the changes in these

respects have proceeded to a morbid state, we can hardly perceive them when in a lesser degree, or say how far they can, or actually have, a share in distinguishing the temperaments of men in health.

From the several remarks we have now offered respecting the serosity, it clearly enough appears, that there is a portion of the mass of blood which is always in a saline and acrid state; and nothing has been more common among physicians than to suppose that an acrimony of the fluids is a frequent cause of disease.

It is very possible that it may be so, and upon many occasions it certainly is so; but it appears to me that the supposition has been too rashly and too frequently admitted, and that it has been for the most part purely gratuitous, without any proper evidence of it in fact. The possible species of acrimony have been little understood, and several of them altogether erroneously supposed. Others of them, though possibly occurring, have not been shown really to take place in any unusual quantity; and the phenomena adduced in proof of them may be commonly explained from other causes, and are certainly often produced by causes of a different and even contrary nature.

With respect to the various acrimony which we have allowed to be constantly present in the serosity, it is probable, that upon different occasions it may be in greater or lesser quantity; but for this very reason of its being constantly present, we must conclude that it does not stimulate the system very strongly. This happens partly from these acrids being constantly diffused in other mild fluids, partly from the arterial system not being sensible to such a stimulus, and partly from the acrids stimulating the secretory and excretory organs to a larger excretion, whereby they are by one or other excretion immediately thrown out of the body. From these considerations, I conclude, that a spontaneous and noxious acrimony does not frequently arise; for the greatest part of mankind pass their lives without feeling any of the effects that might be imputed to it: and although there are some instances of its operation, these are very rare, and commonly in consequence of unusual and violent circumstances in which the body has been placed.

With respect to acrid matters introduced into the body from without, there is no doubt that many of these are sufficiently powerful in disordering the system: but there are certainly also many thrown in that have no effect at all: for not to mention the various precautions which nature has taken to prevent their reaching the mass of blood, I think it is only necessary to observe, that even when in the mass of blood, they are rendered innocent, by their being joined with, and diffused in, the serosity, and with it soon thrown out by one or other of the excretions; so that some of the most acrid, as mercury and cantharides, show their effects only in the secretory or excretory organs.

Upon the whole of this subject, therefore, I would conclude that

the supposition of an acrimony, as the cause of diseases has been too frequently admitted in our modern pathology: and that it ought not to be admitted, unless when the causes and existence of it are well ascertained.

To conclude, I will not deny that the state of the fluids may have a share in distinguishing the different states of the body both in health and in sickness: but at the same time I must maintain, that we know little of the manner in which it may have this effect: that our theory of the human fluids is still very incomplete and imperfect; that while in this condition it has been employed too rashly and too largely in every part of the system of physic; and that we have little temptation to do this, as it is highly probable that the state of the fluids depends very much upon other circumstances of the constitution, which are more fundamental, and more powerful in determining the several conditions of it.

ARTICLE III. *Of the Distribution of the Fluids.*

The third circumstance by which we suppose the temperaments of men may be distinguished, is the different state of the distribution of the fluids, and also the different state of the balance in this respect between the several parts of the system.

It is in the first place evident, that it is chiefly by the action of the heart that the blood is propelled into the several vessels of the body: for although the action of the arteries contributes to promote the motion of the blood, and although upon certain occasions the action of the arteries in particular parts may be increased or diminished, so that the momentum of the blood in particular parts is promoted or abated without any change in the action of the heart; yet it is presumed, that in the ordinary state of men in health, the action of the arteries is exactly in proportion to the action of the heart in distending them; and therefore that we may hold the action of the arteries as given, and consider the heart alone as the moving power.

The action of the heart, therefore, taking place, the distribution of the blood into the several parts of the body will be in proportion to the capacity of the vessels, and in proportion to their density or resistance in the several parts. Of this we have a clear example in the gradual formation of the body from its first beginning to its full growth; during which the parts are successively evolved, some of them attaining sooner than others their full growth, owing, as it appears to me, to the different state of the capacity and resistance of the vessels at the different periods of life; which, again, is probably determined by the state of the original stamina.

This makes a considerable difference in the state of a man at different ages, during the gradual growth of the body; and it appears

more especially with respect to the head, which, for several purposes of the animal œconomy, is first evolved, and comes first to its full size. This certainly happens from the vessels of the head being, in respect of capacity and density, suited to that end; and consequently in the first part of life, the blood is determined in a proportionally greater quantity into the vessels of the head than into other parts of the system: and it is sufficiently probable, that this proportion is greater as the animal is nearer to its origin, and continues greater till the body attains its full growth; after which, however, it continually decreases as the animal advances to that period when it may be supposed to cease.

When the body has arrived at its full growth, we very generally find a symmetry and exact proportion established in the size and bulk of the several parts which fall under our observation; and we may then suppose the distribution of the blood to be suited exactly to that proportion. This indeed takes place with great uniformity in the most part of men: but I still deem it possible, that a disproportioned capacity in certain parts may occur in certain men, and subsist in them through the whole of life. Accordingly, it has been commonly observed, that men of large heads, and large in proportion to the length of their bodies, are more liable to a plethoric state of the vessels of the head, and to the diseases depending upon it. I have also remarked in several instances, that men having their feet and hands shorter than in the usual proportion to the rest of the body, were more liable to a plethoric state of the lungs.

This leads me to observe, that of the proportions of the capacities of the several parts of the body influencing the distribution of the blood, one of the most considerable is, the difference of the capacities of the vessels of the lungs, and of those of the system of the aorta. It is especially discovered by the size of the thorax with respect to the other parts of the body; and this may be considered as occasioning a considerable difference in the constitutions of men. What effects it has in disposing to certain diseases, is well known to physicians.

Upon this subject of the distribution of the blood, it is particularly to be taken notice of, that there is a certain balance between the force of the heart, and the resistance of the extreme vessels by which the perspiration is thrown out. It is probable, that upon this, the state of that excretion in different persons very much depends; and which, perhaps, may be illustrated by this, that the resistance of the extreme vessels seems, in some cases, to be so great as to diminish the perspiration, and in consequence the appetite. Accordingly, the circumstance of men of considerable bulk, and tolerably full habit, having less appetite, and taking in less food, than others of the same bulk usually do, in my opinion may be ascribed to the weakness of the heart with respect to the extreme

vessels; and on the other hand we find men of a moderate size, and of a lean habit, take in very largely of food; which I think must be imputed to the force of the heart being in them, great, with respect to the resistance of the extreme vessels.

With regard to the balance between the heart and extreme vessels, we cannot fail to remark, that although the interruption or diminution of perspiration is often owing to cold constricting the vessels, and increasing their resistance to the action of the heart; yet it is at the same time evident, that it frequently may be owing to the weakness of the heart not pushing the blood with due force towards the surface of the body, that this last is rendered more liable to be affected by cold. This disposition to be affected by cold may take place not only occasionally, as it may in most persons, but seemingly it subsists in some through a great part of life, and therefore may be considered as distinguishing the different conditions and temperaments of men.

Of all the differences occurring with respect to the distribution of the blood, there is none more remarkable than that of the proportion of the quantity in the arteries and veins. It is now ascertained, that this is different at different periods of life, from the difference occurring in certain circumstances of the arteries and veins at those different periods: for it is now known, that the coats of the veins have a greater proportional density in young animals than in old; and therefore the resistance being greater in the veins at the one period than the other, less blood will be received into the veins, and more will be retained in the arteries. This difference of the quantities of blood in the arteries and veins manifestly occurs in the ordinary progress of life: but it is also probable, that in some persons the same difference, to a certain degree, takes place through the whole course of life, and gives a constant and considerable difference in the temperaments of men, as I shall mention more fully hereafter.

ARTICLE IV. *Of the different Proportion of Solid and Fluid in the Body.*

A fourth circumstance producing a difference of temperament, is the different proportion of solid and fluid in different persons. That this proportion varies at different periods of life; that in young persons the solids are less dense and the number of vessels is greater; and that consequently the proportion of fluid to solid is greater in young persons than in old, there can be no doubt: while, on the other hand, the quantity of solid is constantly increasing, and the number of vessels diminishing through the further course of life; so that these circumstances in old age are all of them entirely reversed. These conditions, therefore, are ever varying in the progress of life, and at the different periods of it, may be sup-

posed to be suited to the œconomy: but at the same time, there are circumstances which vary this matter, independent of age.

In the first place, as we have already remarked that the density of the simple solid is determined by the state of the original stamina, so the conditions of the system by which the change we have mentioned is produced, may be supposed in some measure to be determined by the same circumstance. In consequence of this, the solids throughout the whole of life may be more dense in proportion to the size of the vessels; so that the proportion of fluid to solid, may be different in different persons of the same age, and in this respect, throughout the whole of life give a difference in the temperaments of men.

In examining this subject, it is necessary not only to take into view the quantity of solid and fluid compared together on the whole, but to consider also the manner in which they are applied to one another. As the solids are formed into hollow tubes or vessels, through which the fluids are in constant motion, we must consider to what degree the vessels are filled by the fluids moving through them.

In this view, it is evident that by the blood moving more slowly as it recedes farther from the heart, the vessels containing the red blood are constantly stretched or distended in every dimension beyond the size they would assume if no stretching power was applied to them; and this is what may be called a plethoric state of the system. Such a state is necessary not only to the evolution of the system, and consequently during the growth of the body, but throughout the whole of life it is requisite to the action of the vessels, and to the due tension and action of perhaps every fibre of the system. This, however, may be different in different persons at the same period of life; so that the vessels may be stretched more or less beyond their natural capacities. In infancy, the solids are lax and yielding, and the vessels can bear to be stretched more than they commonly are: but as from that period the density and resistance of the solids are perpetually increasing, so the tension of the arterial system is constantly approaching more and more to what it is able to bear, till at length the force of the heart can no longer extend the arteries at all, and a greater quantity of blood is thrown into the veins. In this condition matters remain through the rest of life; but at the same time both kinds of vessels remain in a plethoric state.

From this view of the subject, it will appear that the human body, for the purposes of health and the proper exercise of its functions, is constantly in a plethoric state; but it is still supposed, that upon occasions it may be more or less so, and may be to such an excess as to produce either a disease, or at least a stronger tendency to disease. Indeed it is possible, that throughout the whole of life, the quantity of blood, and consequently the fulness and tension of the vessels, may in some persons be in a greater pro-

portion than in others, and thereby have a share in distinguishing the temperaments of different men.

This last supposition has been universally admitted, and probably is well founded, although I find it difficult to determine certainly when it does really take place. It may perhaps in general be determined by the fulness of the pulse, the apparent size of the vessels on the surface of the body, the ruddiness of the complexion, and the general succulency of the habit. With respect, however, to the latter circumstance, we are apt to be deceived by our not being able in many cases to discern whether the plumpness of the body is owing to the fulness of the blood-vessels, or to the quantity of oil in the adipose membrane. The causes of both are very much the same; and it is only when the fulness of the habit takes place to a considerable degree, that we can with any certainty ascribe it to obesity, rather than to plethora or a fulness of the blood-vessels.

This necessarily leads me to take notice of the different state of the adipose membrane, as giving a considerable difference in the constitutions of men. The different states of the adipose membrane are for the most part abundantly obvious; and the effects of obesity are often sufficiently observable: but upon what internal state of the body, or upon what modification of the æconomy, it always depends, is not easily to be ascertained. It may be supposed in general to depend upon the quantity of nourishment, and in particular upon the oily quality of the aliment taken into the body. But although it certainly does often, *cæteris paribus*, depend upon these, yet at the same time we are certain it does not always depend upon these alone, and that in producing it many other circumstances may concur.

It seems to me very possible, that the aliment being given, the digestive and assimilating powers may often produce fluids more or less disposed to admit of a more or less ready separation of oil, and consequently of its secession into the adipose membrane; or that, on the contrary, the same powers may produce fluids in a more saline state, and in which the oily parts are mixed in such a manner as to render them more ready to pass off by the excretions. It is well known, that an active circulation which powerfully supports the excretions, is also powerful in preventing the accumulation of oil in the adipose membrane, and that this indeed happens in many persons without any assistance of bodily exercise; but we know also that this accumulation of oil is especially prevented in those who take a great deal of such exercise; because this not only supports and promotes the excretions; but gives occasion likewise to the constant absorption of the oil which had been before deposited in the adipose membrane.

Whether a condition in the mass of blood disposing it to produce a copious serosity, may not be a means of increasing the absorption of oil for the purpose of involving an increased acri-

mony, I cannot positively determine; but this seems to be very probable, because we find emaciation to be the consequence of a morbid acrimony prevailing in the fluids, as is evident in cases of scurvy, syphilis, and cancer.

To all these causes increasing or diminishing the fulness of oil in the adipose membrane, and which, in cases of obesity or leanness, may allow us in general to judge of the state of the system, and in particular of the state of the fluids, we must add a consideration which relates to the functions of particular parts. The secretion of oil does not seem to me to be yet clearly explained; but in general it may be supposed to depend upon a peculiar organization in the secretory organ, or in the cellular texture receiving it; because it manifestly takes place in some parts of the body more than in others. For example, it takes place in the omentum more than in the mesentery; and it is often found in preternatural quantity, or in greater proportion, in certain parts than in others: so that we must suppose it to be occasioned by some peculiar circumstances of those parts; and may therefore presume, that in the organs concerned in this business over the whole body, there is a peculiar constitution which, independent of all the others we have mentioned, has a great share in giving that state of obesity or of leanness which often marks a difference in the temperaments of men. At the same time, the cause of this is not yet well explained.

Before concluding this subject, it may be proper to observe, that although a plethora or the fulness of the blood-vessels, and obesity or fulness of the adipose membrane, are very different circumstances, yet it is probable, that the fulness of the adipose membrane does not always compress and diminish the size of the blood-vessels, and gives a plethora *ad spatium*, which has often the effects of the plethora *ad volumen*; and I have frequently remarked, that while persons of a fat habit may require evacuations of blood, yet at the same time they bear them worse than persons of a lean habit do.

ARTICLE V. *Of the State of the Nervous Power.*

A fifth circumstance that may serve to distinguish the different temperaments of men, is the different state of the nervous power. As we have already said, that the motions of the human body very generally begin in the motions of this power, and that the motions which commonly follow it depend upon the existence and state of the same power in the other parts of the system; so this power may be considered as the prime mover in the animal œconomy; and therefore the different states of it must unquestionably have a chief share in distinguishing the temperaments of different men.

Its effects, however, in this respect, have, till very lately, been but little taken notice of. The general doctrine of the tempera-

ments, as depending upon the state of the moving powers, has indeed been delivered by several writers; but there are none of them who have prosecuted their enquiries so far as to ascertain those different states of the moving powers which may especially produce the difference of temperaments. I shall now attempt this subject; but, fully aware of the difficulties that attend it, I shall suggest what I have to offer with a great deal of diffidence.

The different states of the nervous system may, I think, be referred to three heads; according to the different state of its Sensibility, its Irritability, and its Strength.

As the motions of the nervous system are most commonly excited by bodies acting upon the sentient parts; so I shall begin with considering the sensibility of the system.

Of Sensibility.

We have before defined sensibility to be that condition of the living body, whereby it is capable of being affected in a peculiar manner by the impulse of other bodies on certain parts of its nervous system; and which are therefore properly named its Sentient parts.

The extent of the sentient parts, although perhaps it may not be yet entirely, is, however, pretty fully, ascertained; and that in general the sentient parts are the nerves, and every part into the composition of which nerves enter, so as to be exposed to the impulse of other bodies. We are not, however, concerned here in any dispute upon this subject; having to consider only the degree of sensibility that may be in common to the whole of the sentient parts, and how far that may be constantly different in different persons.

In considering this, we can perceive pretty clearly that the sensibility of persons is different at the different periods of life; and that it may be occasionally varied by the temperature of heat and cold applied, by the application of stimulant or narcotic powers, by the state of sleep and watching, and by some other conditions of the body. All these causes occasionally changing the state of sensibility, may deserve much attention in pathology: But I omit them here, and enquire only after those permanent states that may give a different degree of sensibility to different men at the same period of life, and modify the operation of occasional causes throughout the whole of it.

In this enquiry, I shall consider sensibility as it may depend either upon the state of the sentient extremities, or upon the state of the sensorium.

With respect to the first: In so far as these extremities are the organs of peculiar sense, their sensibility may appear different according to the different state of the organ conveying and transmitting the impulses of external bodies to the proper sentient medullary extremities; and in this way the sensibility of different organs may be very different in the same person: but these differences we

at present neglect, and enquire only into the different states of sensibility in the proper sentient medullary extremities, which may be in common to the whole of the sentient parts of the same person, but may be different in different men.

This difference may, I think, depend either upon the different mobility of the nervous power, or upon the different degree of tension in the nervous extremities.

I here presume with some confidence, that the motions occurring in the nervous system are the motions of a subtile elastic fluid somehow connected with their medullary substance; and I suppose that this fluid may have its density and elasticity in a certain proportion to one another, but this varying in different persons, and in the same person at different periods of life. From hence it will follow, that as the elasticity is greater with respect to the density, the mobility of the fluid will be greater, and the body in which it takes place will have a greater degree of sensibility; and on the contrary, that a lesser sensibility will result from a greater density with respect to the elasticity.

That such a difference in the proportions of elasticity and density does actually take place, may be readily concluded from what happens in the course of life, where we can distinctly perceive that the sensibility is gradually diminishing as the density of the simple solid is increasing: and if, as we have said above, the original stamina give a different state of the density of the simple solid in different persons, and that proportionally through the whole of life, we shall have no difficulty in supposing that the same circumstance will give a difference in the proportional density and elasticity of the nervous fluid, and therefore a difference of its sensibility. It is much in illustration of all this, that the sensibility is evidently less, according as the strength of the system following the density of the simple solid is greater in different persons, as well as at the different periods of life.

The difference of sensibility may therefore depend upon the different condition of the nervous fluid inherent in the medullary substance: and that it is liable to be in such different conditions, we learn from the different causes of the difference of sensibility mentioned above; some of which, such as narcotic powers, or heat and cold, affect the sensibility of the nerves, even when entirely removed from all connection with the other parts of the system.

A second circumstance determining the state of sensibility, seems to be the degree of tension that is given to the extremities of the medullary fibres in all the several organs of sense. To explain this, I suppose that the motion of the nervous fluid is an oscillatory motion in an elastic fluid, and that the most part of impressions made upon the organs of sense are made by the impulses of the oscillatory motions of other elastic fluids; and if all this be just, it will be evident that the motions excited in the nerves by

impulses upon their extremities, will be more or less considerable according as these extremities are under a greater or lesser degree of tension. For giving this necessary tension, nature seems to have provided, by distributing a very copious ramification of blood-vessels among the medullary fibres that are properly the sensorium in every organ of sense. It is no where more remarkable than in the retina of the eye; and that the tension of the blood-vessels must give a tension to the medullary fibres thus intermixed and coherent with them, is sufficiently probable. That the increased tension of the blood-vessels has an effect in increasing the sensibility of the eye, is well known from many cases of ophthalmia, or, as I may otherwise express it, in the cases of afflux of blood into the vessels of the eye; in which the sensibility of the retina is increased to a prodigious degree. The increased sensibility both of the eye and ear that commonly attends phrenitis, is readily explained in the same manner; and some other illustrations might be given to the same purpose.

I had a case in which the feeling of a hand was lost: and it was afterwards clearly perceived, that the loss of feeling was owing to a palsy of the brachial artery, whose pulsations gradually ceased from the wrist to the arm-pit; whence I judged, that the loss of feeling was to be imputed to the want of blood and tension in the papillæ of the skin, into each of which we know a branch of an artery enters.

It will appear, therefore, that the sensibility of the extremities of the nerves depends in some measure on the degree of tension given to them by the blood-vessels constantly intermixed with them: and as we have said, that the constitutions of men are different by the difference of their plethoric state; so the difference of their sensibility may be merely on this account greater or less.

It has been already observed, that the constitution of the nervous fluid corresponds in some measure with the other marks of strength or weakness in the system; and this I suppose to take place in every person through the whole of life, and therefore to afford a proof of its depending on the state of density in the nervous fluid.

Before dismissing the subject, I think it necessary to explain a case of occasionally increased sensibility that may occur in any person or at any period of life. It is the increase of sensibility on occasion of any unusual increase of debility. In order to account for this, we suppose the whole of the nerves, or the whole of the medullary substance of the nervous system, to be every where pervaded with the subtile elastic fluid above mentioned; and that this elastic fluid will always bring its several parts to a balance with one another, so as to become of the same density in every part. At the same time it is highly probable, that in the brain, as being the principal seat of this system, and to which all

the other parts are in some measure united, there is a common centre of motion and power; from whence, in consequence of certain circumstances, the nervous fluid is determined with greater force, and perhaps in larger quantity, into some parts than into others. This is what I would term the Action or Energy of the Brain; and it is particularly evident in the operations of the nervous power in the case of voluntary motions. It is most probably a certain degree of this energy which constantly supports the fulness in every part of the nervous system; and it is also pretty plainly this which supports the inherent power of the moving fibres.—Indeed it is equally probable, that the same energy supports the fulness and density of the nervous fluid in the sentient extremities. And from all this, it appears to me that we may readily understand why the weakened energy of the brain, as not supporting the usual density in the sentient extremities, should produce a greater degree of mobility, and consequently of sensibility.

It is in this manner I would endeavour to account for the increased sensibility accompanying so many cases of debility: but it is to be observed, that in certain cases this weakening of the density of the nervous fluid in the sentient extremities may go to excess, and destroy sensibility and sense altogether.

This doctrine of the energy of the brain being, in a state of health, constantly extended every where to the sentient as well as to the moving extremities of the nerves, may be illustrated from remarking that when, upon any occasion, the energy of the brain is gradually failing, the effects of this every where appear from the loss of sense and motion, happening first in the parts most distant from the brain, while they are found to subsist longer in these parts which are nearer to it.

We have thus considered the state of sensibility as depending upon the state of the sentient extremities: but I have mentioned that it may also depend upon the state of the sensorium commune; and which, therefore, now requires our attention.

Before entering particularly upon this, it may be stated as a question, Whether the state of the nervous cords transmitting motions from the extremities to the sensorium, may not affect the sensibility of the system? And on this subject it might be supposed, that the state of the membranes enveloping the nervous fibres in their course, as well as the state of the cellular texture and blood-vessels laid in these envelopements, and seemingly every where interposed between the several nervous cords, should, according to the different circumstances of these interposed parts, render the conveyance of the motions of the nervous fluid from the extremities to the sensorium more or less free and forcible. It is indeed sufficiently probable, that the state of these circumstances may have effects in this matter; but we hardly know the cases in

which they operate, and still less how far these circumstances are permanently different in different men.

Supposing, however, the motions propagated from the extremities to the sensorium to be quite unaffected in the course of the nerves, our question then must be, How far the effects of these motions in producing a sensation are affected by the state of the sensorium itself? With regard to this question, it may, in the first place, be presumed that the constitution of the nervous fluid, with respect to the density and elasticity, will be the same of the sensorium as in the extremities; and therefore, so far as it depends upon this constitution, the sensibility will be in the same degree in the one as in the other. It is likewise equally probable, that a certain degree of tension in the medullary substance of the brain given to it by the fulness of the blood-vessels there, will also have the same effects on sensibility as I have alleged in the case of the extremities.

As, however, the state of tension in the vessels of the brain may, upon certain occasions, be greater than in the sentient extremities of the nerves; so this state of the sensorium may be a cause of greater sensibility, while the force of the motions propagated from the sentient extremities remains the same as before.

Nothing indeed is more evident than that the energy of the brain, that is, its action in determining the nervous power into the rest of the system, depends very much upon the fulness and tension of its blood-vessels; and it is therefore to me probable, that the degree of sensibility in the sensorium will in some measure depend upon the same circumstance. It may perhaps be started as an objection to this, that a certain excess of fulness in the blood-vessels of the brain, seems to have the effect of destroying sense altogether; and that any preternatural fulness might have, in some measure, the effect of impairing the sensibility of the sensorium.—The first part of this is indeed true; and I dare not assert that a certain degree of fulness may not render the motions of the nervous power less free, and thereby impair the sensibility of the sensorium: But still this will not destroy the opinion otherwise so well supported, that while the motion of the nervous power remains in a certain measure free, a certain degree of fulness is necessary to the energy of the brain, and therefore that a certain degree of it may increase sensibility.

We have thus found, that sensibility, so far as it depends upon the constitution of the nerves and nervous fluid, will be the same in the sensorium as in the sentient extremities. We have likewise found, that an increase of the sensibility of the system may arise from an increase of tension in the blood-vessels of the brain, as manifestly happens in the case of phrenitis and some other diseases: and there is yet to be mentioned a state of the sensorium, which, in another respect, affects the sensibility of the system.

Every body knows that the most part of sensations arising in the sensorium are accompanied with what is called a Reflex Sensation, that is, a sense of agreeable or disagreeable in the simple sensation; and the circumstances of this have a great share in determining the effects of the sensation upon the system. This I take to be entirely a function of the sensorium, which, according to its different conditions, is fitted to increase or diminish the state of reflex sensation. That the condition of the sensorium is upon different occasions different in the same person, is sufficiently obvious; and it appears to me no less obvious, that however it may be varied on different occasions, there is a character or tone in these respects runs throughout the whole of life, and is a circumstance very much distinguishing the different temperaments of men. It is indeed difficult to ascertain the condition of the sensorium that disposes it to have agreeable or disagreeable sensations more or less readily, or in different degrees excited in it; but though this cannot be done, yet it is very proper to mention it as modifying the sensibility of the system, and therefore of great influence in the pathology of physic, and in distinguishing the moral characters of men.

Having now treated of the sensibility of the nervous system, I shall proceed, in the next place, to consider its irritability; which may have a great share in distinguishing the temperaments of men.

The general idea of irritability has been already mentioned; and we have likewise observed, that this property belongs only to certain fibres of a peculiar structure and conformation fitting them for this purpose.

Of Irritability.

In what I am to offer upon this subject, I abstract entirely from the force with which the contractions of moving fibres may be performed, which by some may be comprehended under the title of Irritability; but at present I consider only the readiness or facility with which the contractions of moving fibres are excited.—It is very probable that certain circumstances of this conformation may be so different in different cases, as to give different degrees of irritability; but both of the general structure, and of the varieties of it which may occur in particular cases, I am entirely ignorant.

Our late physiologists have supposed that there is a degree of greater irritability in certain muscles and moving fibres than in others; and particularly, that it is greater in those of the heart, the alimentary canal, and diaphragm, than in those of the other parts of the body. But whether this be owing to any peculiarity in the structure of the fibres in those more irritable parts, or merely to the power of habit, which by repetition seems to give a greater irritability to every fibre of the system, may be justly

a question. It does not appear to me that we have evidence of any peculiar structure in the fibres of the heart, or other supposed more irritable parts; and at the same time, as we know them to be most constantly under the most frequent repetition of their contractions, I am persuaded that their seemingly greater irritability, or rather the persistency of their irritability, is owing entirely to the power of habit.

Presuming, therefore, that we do not know the circumstances of the moving fibres themselves, which might give them in certain cases a greater degree of irritability, we must seek for the causes of this in some general circumstances of the system. On this subject, the most obvious conjecture is, that the irritability of the moving fibres depends upon the same causes with the sensibility of the system. Many observations prove that these two qualities or conditions are commonly in the same degree in many persons; and it is probable that the lesser density of the nervous power, which renders it more moveable in the organs of sense, may also render it such in the organs of motion. It seems to happen accordingly in young persons, in the female sex, and in all persons naturally or occasionally weak.

This leads to the supposition that irritability and sensibility are in the same degree, and depend upon the like causes in every person: and as the contractions of moving fibres produced seem to be commonly in proportion to the irritation applied, which is so often a certain sensation; so it might be supposed that a general irritability being given, the state of it with regard to particular contractions might be neglected, and these contractions be referred entirely to the state of sensibility.

This certainly may be judged to be often the case: but it appears to me that we must not suppose it in all cases; because it seems evident that sensibility and irritability are not always in the same condition in the same person. I conclude this from observing that these two qualities are often under different laws. With respect to sensibility, it is well known that the force of impressions in exciting sensation is by repetition constantly diminished; whereas, by a like repetition of motions, the readiness with which these motions are repeated, or what may be called the irritability of the parts, is as constantly increased. Thus, in certain cases where motions are frequently repeated by the application of the same impression, sometimes the one of the laws mentioned takes place, and sometimes the other; so that sometimes to produce a repetition of the same motion, the force of the impression employed must be constantly increased; and in other cases the motion may be repeated though the force of the impression be constantly diminished. These are cases with which physicians are well acquainted; but in what circumstances the one or the other law takes place, I cannot certainly determine.

However that may be, the whole of these phenomena seem to me to show, that the sensibility and irritability, either in the whole of the system or in particular parts of it, may, on certain occasions, be in different conditions: and of what extent this consideration is in the animal æconomy, must be well known to every person who has studied the powers of habit.

Besides these causes of a difference of irritability, another condition may be mentioned in which the irritability is affected by other circumstances than the general state of the nervous system; and therefore may be independent of the state of sensibility in the same person. Although we cannot assign the state of the muscular fibre itself which gives it its peculiar state of irritability; yet in the whole of a muscle, and perhaps in every collection of moving fibres, there seems to be a circumstance which has a considerable effect.

We plainly perceive, that a certain degree of tension in its fibres, is necessary to the proper action of every muscle; or at least, it will be readily allowed, that a certain tension is necessary to produce the vigorous action of any of these organs: and physiologists have observed the means employed both by nature and art to give this necessary tension. Besides the extension of muscles in their whole length, which in many cases may be more or less, it appears to be also necessary that every particular portion of their fibres should be kept in some measure in an extended state. This I suppose to be done by means of arteries being every where intermixed with the moving fibres, in such a manner as to lie across the length of these fibres, and thereby necessarily, by their constant fulness and occasional distension, extend to the fibres that pass over them.

The theories which were formerly offered to explain the purpose of nature in intermixing so many blood-vessels with the moving fibres, are now generally exploded; and the only theory which seems to be at present tenable, is, that it is the purpose of nature to give thereby heat and tension to the moving fibres. This provision of nature is necessary upon the footing I have just now endeavoured to point out; and it will at the same time appear probable, that a certain degree of tension will not only give vigour, but also a greater degree of irritability to muscular fibres; so that the greater or less fulness of the arteries may give a state of irritability independent of the state of sensibility in the system; as seems evidently to take place in all those cases of plethora which we can distinguish from obesity.

Having thus considered irritability as properly residing in the moving fibres or living solids alone, and having considered its various states in these, I judge it necessary now to take a larger view of the subject, and, under the term Irritability, to comprehend the state of those motions, which, beginning in the sensorium are directed from thence along the nerves to the several

moving fibres, and are very generally the beginning of all the motions which take place in the muscular or moving fibres of the body. The degree of facility or readiness, more or less, with which these motions beginning in the sensorium are excited, I would term the Irritability of the Brain or Sensorium; and this we are now to consider farther.

This beginning of motion in the sensorium is most remarkable in those cases in which it is accompanied with, or appears to be excited by volition. Except, indeed, in those cases, physiologists have commonly considered the brain as an inert and passive organ, having no motions taking place in it, but in proportion to the impulses proceeding from the sentient portions of the nerves, and the sensations arising from thence. I am, however, disposed to believe, that in consequence of the impulses very constantly proceeding from the sentient portions of the nerves, and even independent of any sensation arising at the same time, there is a new power and force of motion excited in the brain, and from thence very constantly directed into every part of the nervous system. This is what I have called the Energy of the Brain; and have alleged, that not only in consequence of sensation and volition, but, without either of these, in consequence of certain other impulses, this energy is manifestly exerted, and excites, with more or less force, the contractions of moving fibres; and farther, that from the impulses very constantly proceeding from the sentient parts, though producing neither sensation or volition, the same energy is excited and exerted so as to support the fulness both of the sentient nerves and of the inherent power of the moving fibres. From all this it will be understood, that under the title of the Irritability of the Brain, I comprehend the greater or lesser degree of readiness with which the energy of the brain is exerted in all its various operations upon the moving fibres.

Having thus explained my idea of the irritability of the brain, I proceed to consider its various states: and, in the first place, in those cases in which the beginning of the motion is either accompanied with, or is produced by volition; which are always the cases most distinctly observable.

Volition arises in two ways: First, when sensations arising either without, or with very little, reflex sensation, give occasion to the exercise of the judgment in marking their various relations, and their consequent fitness or unfitness for human affairs, they thereby give occasion to various desires, and therefore to volitions for producing those motions of the body that are suited to the ends desired. These volitions may be more or less powerfully excited, according to the operation of the intellectual powers in marking the fitness or unfitness of things: and a different state of these powers, and a quicker or slower perception of relations, certainly distinguishes the temperaments of men. We know little, however, of the physical causes of this; and it is seldom that the

difference of the intellectual powers gives such a difference of temperament as may particularly affect the physical state of the human body, and thereby the operation of medicines. We therefore omit the further consideration of the irritability that may take place in the volitions arising from intellectual operations; and this the more especially, because I believe it is never discernible excepting when the intellectual conclusion excites a considerable degree of reflex sensation; and when, therefore, the irritability is in the same condition with that we are now to mention in the second place.

A second case of volition excited, and exciting, is, when the sensations, either altogether without, or with very little, intellectual operation attending them, produce these various modes of volition, which we distinguish by the names of Appetite, Propensities, and Emotions or Passions. With respect to the two first, we believe that the volition and the motions produced by it are always exactly in proportion to the stimulus applied to the particular parts, from which the propensity or appetite arises; and I cannot clearly perceive that, in modifying this, the irritability of the brain has any share.

It is only in the case of emotions or passions, that is, the modes of desire and aversion of the stronger kinds, that we can suspect a different degree of the irritability of the sensorium to take place. Mankind very generally suppose in different men a different degree of irritability in this respect: and as the whole of the motions here concerned are in the sensorium itself, the irritability must likewise be especially there. I entertain indeed no doubt that such an irritability takes place; but so far, however, as I can perceive, such irritability must depend upon the same causes as the sensibility of the sensorium with respect to the production of reflex sensations. To this purpose, we must remark, that in proportion as sensations are agreeable or disagreeable, they must excite desire or aversion in different degrees; and therefore the irritability of the brain in proportion to these; and as it depends upon the same causes, so it must be exactly in proportion to the sensibility in producing reflex sensations. The whole, however, is involved in the same obscurity and difficulty as the peculiar case of the sensibility of the sensorium; so that I shall prosecute the consideration of it no further here; although we cannot altogether quit the subject without taking notice of a curious question that occurs respecting it.

It has been already observed, that sensibility and irritability do in some respects follow different laws, while by repetition the former is diminished and the latter is increased. We have also said, that there may be a different condition of these two faculties, so that there may be an increase of irritability independent of sensibility; and if this is manifest in particular organs, it may also be supposed to take place in the sensorium. I think it truly

does so; and that upon many occasions the irritability of the brain is independent of the sensibility with respect to reflex sensation.

Of Strength and Weakness.

Another circumstance of the nervous system meriting attention, as distinguishing the temperaments of men, is the strength of the body, always, in my opinion, depending on the state of the nervous system. The strength of the body appears always to consist in the force of contraction of the muscular or moving fibres. These, in the living body, are constantly possessed of a *vis insita*, or *inherent power*, by which they have a continual tendency to contract and diminish their length; and the force of this power in different persons, may be considered as giving more or less of strength to the system. It may be difficult to say what this depends upon, although probably it depends upon the circumstance of the muscular fibre, so much connected with the other parts of the nervous system, being fitted to receive and retain a large portion of the nervous fluid, which, as an elastic, must have a continual tendency to contract itself, and the fibre in which it is inherent; and the force of this contraction will probably be according to the density of the fluid which gives the inherent power. If I am right in supposing the state of the simple solid to modify the state of the medullary fibre, this last will contain a denser fluid; as we commonly find the inherent power in the medullary muscular fibre to correspond with the denser state of the simple solid.

This strength of the inherent power, therefore, is one foundation for the strength of the system; but the contraction of muscular fibres does commonly, perhaps always, depend upon a *vis nervæ* derived from the brain. This is especially evident in all the cases of voluntary motion; which being always an action of the brain, there seems to be a motion excited there, that is determined with more force, and perhaps in greater quantity, along the nerves into the muscular fibres. In these cases of voluntary motions, the force with which this power is exerted is regulated by the will, and therefore in various degrees, but cannot be exerted with the same degree of force in every different person; and those with which it can be exerted with greater force than in others, are considered as the stronger persons.

Upon this subject it may be fairly concluded, that the strength will always depend upon the force with which the energy of the brain can be exerted; for although that may, according to the will, be in very various degrees of force, it may be supposed that a volition being given, the energy of the brain may be more strongly exerted in one person than in another; and therefore the state of this energy, with the state of the inherent power, will determine the strength of every system; or, as I think it may be shown that the state of the inherent power depends also upon the energy of the

brain; so this alone may be considered as determining the strength of every system.

The question, however, upon this arising, is, What gives a stronger energy of the brain in one person than in another? The answer is, that it probably depends upon the state of the medullary fibre containing a nervous fluid of greater density in one person than in another. Indeed it is rendered very probable by this, that in certain diseases of the brain, as in mania, the strength of the system is commonly increased to an uncommon degree; while at the same time we find a great change to have happened in the medullary substance of the brain, by its becoming of a more dense substance than usual.

Having thus explained the cause of strength in general, it is necessary further to explain how, agreeably to these principles, the state of strength comes to differ in a considerable degree at the different periods of life.

That from the beginning of life to a certain period, the strength of the body should be constantly increasing, will be readily explained by the increasing density of the simple solid, and with that the density of the nervous fluid in the medullary fibre.

This, however, has its limited period; for although the density of the solid is still considerable, and even going on to increase, yet the strength of the system does not increase beyond a certain degree; and, on the contrary, is from a certain period constantly declining.

This remains to be explained; and may be attempted in the following manner. We have said that the nervous fluid has the properties of elasticity and density combined in a certain proportion; but that this proportion is constantly varying in the course of life. In the beginning, the elasticity is great in proportion to the density; but while the cause of any increase of elasticity is not known, the increase of density, from what we have said before, is evident and certain; and accordingly with that the strength of the system is constantly increasing. If, however, at a certain period it shall happen, that the density shall be increased to such a degree that it is not moveable by the same impressions on its elasticity as are necessary to excite a strong vibration, the strength of the system can increase no further; and, on the contrary, according as the density is constantly increasing, the force of the energy of the brain must be perpetually diminishing, and with that the strength of the system continually declining.

This is agreeable to the phenomena. In the beginning of life, sensibility depending upon the mobility of the nervous fluid, is considerable; but as life advances, it is constantly diminishing, whilst the strength of the system is still increasing: and after a certain period, while both the elasticity is farther diminished and

the density farther increased, the strength that can be exerted must be continually declining.

This perhaps may be illustrated by some other considerations. In the beginning of life, the force of the heart is strong with respect to the system of arteries; and the latter accordingly become stretched out, and the body grows in bulk. This, however, we know, by the increasing density of the arteries, goes on more and more slowly till it stops altogether.

Whilst the force of the heart is constantly filling and distending the arterial system, we may suppose the elasticity of the nervous fluid to be supported in every part of the system; and while the density is at the same time increasing, the strength of the body, by the tension and fulness of the arteries, will be supported and increased, as we have explained above.

But we have also observed above, that the exertion of the energy of the brain requires the fulness and tension of the vessels of that organ; and that its energy will be supported and increased by the general fulness of the arterial system. The increasing fulness of this, however, has its limits both from the density of the arteries becoming too great for the force of the heart, and from the resistance of the veins becoming gradually diminished. To explain this latter circumstance, we must remark, that, from the experiments of *Sir Clifton Wintringham*, it appears, that in the beginning of life, the density of the coats of the veins, and consequently their resistance to the reception of blood from the arteries, is proportionally greater with respect to that of the arteries, in young animals than in those that are older: but the density of the arteries, by the action of the heart distending and pressing them, is constantly increasing; while the same power not being applied to the veins, their density is not proportionally increased. From this it must happen, that the density of the arteries constantly increasing will come at length to be proportionally greater than that of the veins, and consequently throw a greater proportion of blood into the latter; and after a certain period, the density of the arteries still increasing and throwing a greater proportion of blood into the veins, the fulness of the arteries themselves will no longer increase, but will rather be further diminished. As we have, however, said above, that the vigour of the system depends much upon the fulness of the arterial system, so, as soon as this last ceases, the former can go on no longer to increase, and will be rather gradually diminishing.

Here, therefore, is another cause of a period being put to the increasing vigour of the system, and at the same time a cause assigned of its thereafter constantly declining. It is sufficiently probable, that both these causes take place together at the same time of life; and with great reason it may be supposed to be nearly at the age of thirty-five.

The whole of this subject might be further illustrated, by showing.

ing that the phenomena, in the decline of life and in old age, may be explained upon the principles we have laid down; but I have not room for such discussions in this work.

I have now considered, under five heads, the chief circumstances of the animal æconomy, and have endeavoured to point out the different conditions in which these may upon different occasions be found: and in attempting to assign the causes of these conditions, I have shown in what manner, and upon what occasions, they may be different in different persons.

Of PARTICULAR TEMPERAMENTS.

It has thus been my endeavour to lay some foundation for distinguishing the temperaments of men: but these temperaments, as has been already observed, are not to be distinguished by attending to any one of these chief circumstances alone; for the state of any of these is commonly combined with a particular state of all the others; and it is only by a combination of the particular states of the chief circumstances in the same person, that the temperaments are to be properly distinguished. To explain this, we presume, that in any one person a particular state of the simple solid is pretty constantly combined with a particular state of the fluids, with a particular state of the distribution and proportion of these, and all these with a particular state of the nervous system; and as such a combination may be formed in another person, but consisting in a difference of the particular states of each of the chief circumstances, this will give a different temperament in these two persons. So far therefore as we can find such combinations to be steadily formed in any particular person, we shall be able to assign his particular temperament.

It must, however, be acknowledged to be uncertain, how far certain states of the chief circumstances of the æconomy are steadily connected together, and therefore how far we can extend our doctrine of temperaments to a great number of different men; but at the same time, it is only by *presuming* upon a certain steadiness of these combinations, that we can go any length in explaining the difference of temperament.

The ancients very early established a distinction of temperaments, which the schools of physic have almost universally adopted ever since, and appears to me to be founded in observation. I am very much of opinion, that we can perceive a combination of a particular state of the chief circumstances of the æconomy to take place very steadily in certain persons, and thereby to form at least two of the temperaments assigned by the ancients. Accordingly, the circumstances in which these two temperaments seem to consist, we shall now endeavour to explain: and I shall hereafter consider how much farther we may proceed.

In doing this, it will be proper, in the first place, to mark out the several external appearances that concur in the same person;

and from which concurrence taking place in many different persons, we are led to presume in these, one and the same combination or temperament.

One to be particularly mentioned, is that temperament which the ancients, and which physicians at all times since, have distinguished by the appellation of the Sanguine. In this, the external appearances are the following. The hair soft, and never much curled, is of a pale colour, or from thence passing through different shades to a red; the skin is smooth and white; the complexion ruddy; the eyes commonly blue; the habit of the body soft and plump; after the period of manhood, disposed to obesity, and at all times readily sweating upon exercise; the strength of the whole body is moderate; and the mind sensible, irritable, cheerful, and unsteady.

Before going further, it is necessary to observe, that as no exact measure can be had of the different degrees in which the qualities we are to mention take place, I suppose a middle state very nearly ascertained by observation; and I am unable to give any other measure of qualities than merely by marking them as below or above the middle state.

Upon this footing I would explain the sanguine temperament as consisting in the following state of the several chief circumstances of the œconomy. I suppose the simple solids to be lax; the mass of blood to be of a moderate consistence; the red globules and serum to be in large proportion; and the serosity to be of moderate acrimony. I presume the heart to be active, and rather strong with respect to the system of blood-vessels; the quantity of blood in the arteries large with respect to that in the veins; and the quantity of fluids in the whole body large in proportion to the quantity of solid; the state of the nervous system to be sensible and irritable, but in every state readily changeable. This temperament is most exquisite from the time of puberty to that of manhood; but continues its character in some measure throughout the whole of life. This temperament is liable to hemorrhagy, inflammation, and hysteria; and with the ancients made the *temperamentum calidum et humidum*.

The other temperament distinguished by the ancients, which I can characterise most distinctly and explain most clearly, is that which has been very constantly named the Melancholic. In this, the external appearances are the following. The hair is hard, black, and curled; the skin is coarser, and of a dun colour, with a corresponding complexion; the eyes very constantly black; the habit of the body rather hard and meagre; the strength considerable; the mind slow, disposed to gravity, caution and timidity, with little sensibility or irritability, but tenacious of all emotions once excited, and therefore of great steadiness. In this temperament I judge the simple solids to be firm and dense; the mass of blood to be of a thicker consistence; the gluten abundant; the red

globules and serum in moderate quantity, and the serosity more acrid; the heart rather torpid, but strong; the quantity of blood in the veins large with respect to that in the arteries; and the quantity of fluids in the whole system moderate in proportion to the solids; the state of the nervous system to be, as expressed above, by the state of the mind, that is, less sensible and irritable, but strong and steady, and disposed to admit the reflex sensations of sadness and fear. This temperament is most completely formed in advanced life; but the characters of it appear often very early. It is liable to melancholia, hypocondriasis, mælena, and hæmorrhoids; and with the ancients made the *temperamentum frigidum et siccum*.

These are the two temperaments we can the most clearly distinguish; because they are almost in every respect the opposites of each other.

With respect to both, I think some illustration may be obtained, from considering what happens to every person both in the body and the mind during the progress of life. Of these changes I have already spoken pretty fully, when treating of the strength and weakness of the nervous system. From the circumstances there pointed out, it will appear, that those which chiefly determine to a sanguine temperament, occur especially in the first part of life; and that those which determine to the melancholic, as certainly occur in the after parts of it. Accordingly, from the effects we may conclude to the causes, especially when at the same time the existence of such causes is clearly ascertained; and therefore we may venture to assert, that the changes which happen in the course of life do well illustrate the doctrine laid down respecting these two temperaments, the sanguine and melancholic.

A further illustration to the same purpose may be drawn from the consideration of the sexes: for it is obvious, that the circumstances of the sanguine temperament, both in the body and in the mind, appear more prevalent in the female sex; while a greater density and less flexibility of the simple solid, with proportional greater density and less mobility of the nervous power, make the character of the male sex approach nearer to that of the melancholic.

I have thus endeavoured to explain the different states of the human body, by referring them to two general states or temperaments, which not only serve to distinguish the most part of men through the whole of life, but also to distinguish the different sexes, and likewise the state of particular persons as they pass through the different ages of life. Our doctrine therefore, will apply very extensively; but perhaps it may not seem to be very readily applicable to that great variety which would appear to take place in the human constitution.

With a view, therefore, to attempt some explanation of this variety, we shall remark, in the first place, that it may in some

measure depend upon the two temperaments, which we have supposed chiefly to prevail, being seldom perfectly formed; or, in other words, upon the particular state of the circumstances in which they consist, being seldom found in the most complete degree. For example, it is seldom that in the sanguine, the simple solid is the most lax, or in the melancholic the most rigid, that is compatible with health. There is reason to suppose, that from the medium state of density and firmness in the solid, there may be various intermediate degrees between the most lax upon the one hand, and the most rigid upon the other; and supposing that with each of these intermediate degrees there is united a corresponding state of the nervous power, there may then be so many intermediate and varying temperaments, neither completely sanguine nor melancholic, though always approaching to the one or the other. This may explain, in some measure, the varieties in the temperaments of men, but it may be justly doubted if it will account for the whole.

It will therefore be proper, in the second place, to observe, that it is doubtful if the chief circumstances of the æconomy are always in the same proportion to one another that has been above supposed. For example, we have supposed that the density and the mobility of the nervous power are always in a certain proportion to one another: but this is not very certainly the case; and if we may suppose, as seems to be allowable, that in two persons, the density being equal, the mobility may be greater in the one than in the other; so that, if this should happen, it will be obvious that it might give a more exquisite formation of the sanguine, or a more moderate state of the melancholic temperament. In this way, it is possible, that with a certain degree of density greater than usual in the sanguine, there may be a mobility greater than in proportion to this, we shall then have a middle temperament between the sanguine and the melancholic, and perhaps what the ancients meant to denote by the title of Choleric; that is, of more strength than in the sanguine, and of more irritability than in the melancholic. It is possible also, that there may occur a simple solid more dense than usual in the sanguine, and at the same time from a more humid state of greater flexibility than in the melancholic; and if, along with these, there be an analogous state of the medullary fibre of less mobility and elasticity in proportion to the density, we shall then have that temperament which the ancients expressed by the title of Phlegmatic; that is, with less sensibility and irritability, but with more strength and steadiness, than in the sanguine, and at the same time with more laxity and more mutability than in the melancholic.

In the whole of this discussion, we have considered the state of the nervous power as chiefly modifying the temperaments of men; and more readily enter into this supposition, because we presume the state of the nervous power to be almost always attended by

a corresponding state of the simple solid, and that both these together pretty constantly modify the state of the fluids, both with respect to their quality, their proportion, and distribution.

Of these latter circumstances, however, constantly following the state of the simple solids and of the nervous power, I am by no means certain. As we observe, that at different periods of life there is a difference between the arteries and the veins, as to the circumstances of density and capacity; so it is possible, that some difference in these respects may be established in the original stamina, and may therefore in some degree run throughout the whole of life, and thus vary the state of the fluids. It is also possible, that there may be conditions of the original stamina determining a difference in the strength and activity of the heart with respect to the capacity of the blood-vessels; or, on the other hand, the state of the heart being given, there may be a difference in the density and resistance of the sanguiferous system. In all these cases, there may arise a difference in the quality, proportion, and distribution of the fluids, and thereby a further variety in the temperaments of men: and thus perhaps we may account for the difference of stature, bulk, and proportion, of the several parts of the body in different persons.

All this might be illustrated more fully; but perhaps we have insisted long enough upon what may by many be thought perhaps too much depending upon conjectural reasonings. It no doubt may, in some respects, be liable to this imputation; but I should fain hope that it may serve to lay the foundation of speculations which must be pursued before we can explain the important, and therefore necessary doctrines concerning the temperaments of men.

On this subject it is very requisite to remark further, that the consideration of the operation of medicines is not only concerned with the general state or temperaments of the human constitution, but also very much concerned with the peculiar conditions which take place in particular persons, or in particular parts of the body; and which conditions are seemingly neither depending upon, nor necessarily connected with, the general temperaments.

Of IDIOSYNCRASIES.

These conditions are what physicians have called *Idiosyncrasies*. The term has been confounded with that of temperaments; but I mean here to express by it those conditions of certain persons whereby certain functions of the whole or of particular parts of the body are affected by applications made to them, very differently from what these functions are affected in others, and very differently from what they are in persons seemingly of the same general temperament.

Of these idiosyncrasies, the greater part of them seem to me to consist in a preternatural degree of the sensibility or irritability of

certain parts of the system, or in a peculiar sensibility or irritability of the whole body, or in particular parts of it with regard to certain applications, and to those only.

Of such idiosyncrasies, those that have been the most taken notice of are those which occur with respect to the effects of taste and odour. Tastes are of considerable variety; but they are reduced to certain classes and orders, in which the most part of men are so well agreed, as to shew that the operation is nearly the same in all of them. This certainly happens with respect to the simple sensation; but with respect to the reflex of agreeable or disagreeable, this is often considerably different in different persons, and shows that there is room here for an idiosyncrasy which accordingly takes place; and there are many instances of it in the records of physic.

The instances, however, of a peculiar aversion in particular persons to certain odours, are much more frequent. The records of physic are full of them; and examples of them are known almost to every body. The sensations arising from odour seem to be more various in different men than those arising from tastes; so that mankind have hardly established any other distinction of the former than that of agreeable or disagreeable. Subdivisions have been attempted, but with no consent of mankind, so as to be expressed with any precision in common language. The sensation, therefore, is probably much varied in different men, and gives room for idiosyncrasies, which accordingly appear without our being able to refer them to any particular classes or orders of odours; and the effects are not less remarkable by the operation of the same odour upon different persons, than by its being so powerful in its degree, producing syncope, hysteria, and epilepsy.

These peculiar effects of sensations are manifestly extended to the alimentary canal. In this, and particularly in the stomach, the sensibility is not correspondent to the general sensibility and irritability of the whole system: for there are instances of strong persons moved by very small doses of emetics; whilst, on the other hand, there are seemingly weakly persons who are not moved but by very large doses of the same.

There are instances of sensibility in the stomach that are peculiar to certain persons, and appearing in few others. But I must acknowledge, with regard to several of these idiosyncrasies, it is not easy to determine whether their effects depend upon an impression made upon the nerves of the stomach, or upon a modification which these substances give to the fermentations and solutions that take place there. For example, if fresh honey gives pains of the stomach to certain persons, as this is obviated by boiling the honey before it is taken into the stomach, it may be a

doubt whether this volatile part of fresh honey operates by an impression upon the nerves of the stomach, or by exciting a more active fermentation there. The acescent fermentation which occurs always in a greater or lesser degree, is manifestly more or less readily excited in different persons; for we know many persons who take in acids and acescents in large quantities, without any appearance of a stronger acescency being excited, while I have known certain others from a very small quantity of acescents taken in, have the strongest marks of a morbid acescency immediately produced.

We know so little of the gastric fluid, and of its operation on different substances, that it is very difficult to explain the idiosyncrasies which take place in certain persons and not in others, with respect to milk, oils, shell-fish, and some other substances. One of the most remarkable is this, that the white of egg, one of the mildest substances in nature, and readily digested in the stomachs of almost all men, cannot however be taken in, even in small quantity, by certain persons, without immediately occasioning much pain and sickness.

In any attempts to account for these peculiarities, it ought to be kept in view, that the stomach is not only affected by sensations depending upon impression, but likewise by those which depend upon consciousness, or a perception of the state of its own action; and that undoubtedly many of its sensations are of the latter kind.

It does not seem necessary to enter upon the consideration of the idiosyncrasies of the intestinal canal, as they are to be explained from the same degree of sensibility that may be peculiar here as in the stomach. What farther may arise from a peculiar state of the bile or other fluids poured into the intestines, we cannot pretend to judge. The various state of the alvine excretion depends upon many different causes which there is no place for considering here; but it is most likely that some of these causes may be more considerable and peculiar in certain persons than in others, and give an idiosyncrasy in that respect. A torpor, or slower motion of the intestinal canal, is especially to be suspected.

We have thus endeavoured to mark out the various causes of idiosyncrasy; and although perhaps we may not have done it completely, yet it is hoped enough has been said to shew, that in the employment of remedies a physician must be directed by the consideration of idiosyncrasies as well as by the general temperament.

In the case of any person, therefore, occurring to a physician for the first time as a patient, particular inquiry should be made respecting the idiosyncrasies which may prevail in his constitution; and if he himself should happen to have had no experience of the effects of particular applications, the idiosyncrasies of his pa-

rents should next be inquired after; for idiosyncrasies are very often hereditary.

We have thus attempted to point out the various states of the human constitution that may be found more constantly different in different persons; but it will be proper now to remark, that these constitutions may be variously modified by those circumstances of climate, diet, exercise, and the like, to which men may be exposed in the course of life, and which it is well known have a great power in changing the natural constitution into one not only very different, but perhaps even opposite. It is therefore well known that a physician in practising upon the human constitution, either for preserving health or curing diseases, must not only consider the temperaments and idiosyncrasies which nature has originally given to the constitution, but must also consider the accidental states of it, which may have been produced by the circumstances and manner of life.

It is, however, not my business here either to explain those various accidental states, or to assign their causes; although it might be proper enough to lay a foundation for that doctrine by explaining the powers of custom and habit in general, as I formerly endeavoured to do it in my lectures on the materia medica. It does not, however, appear to me necessary to do it now, because for a pretty full information on this subject, I can refer to a Dissertation de *Consuetudine*, published some years ago by my son, Dr. Henry Cullen.

To conclude what we have to offer respecting the operation of medicines, it is proper now to remark, as I have said above, that in considering this subject it is very necessary to attend to the sympathy and consent which take place between the several parts of the human system; and although we cannot prosecute this consideration fully here, we must not omit taking notice of one very general case of very great influence in almost the whole of the doctrines of the materia medica, as this particular sympathy is concerned in the operation of the most part of medicines, and explains the operation of many which is otherwise difficult to be understood.

This is the operation of medicines upon the stomach, from which motions are often propagated to almost every distant part of the human body, and peculiar effects produced in those parts, whilst the medicine itself is only in contact with the stomach.

The stomach is the part by which the most part of substances introduced into the interior parts of the body generally pass; and it is endued with a peculiar sensibility, which renders it ready to be affected by every substance entering into it that is active with respect to the human body. Every thing, therefore, of this kind introduced into the stomach operates almost always there, and for the most part only there. It is now, however, well known to phy-

sicians, that the most considerable instance of the sympathy mentioned above, is afforded by the stomach, so connected with almost every other part of the system, that notions excited there are communicated to almost every other part of the body, and produce peculiar effects in those parts, however distant from the stomach itself. This indeed is very well known: but that the effects of many medicines which appear in other parts of the body are entirely owing to an action upon the stomach, and that the most part of medicines acting upon the system act immediately upon the stomach only, is what has not been understood till very lately, and does not seem yet to be very generally and fully perceived by the writers on the materia medica. It will therefore be proper here to say in what manner this doctrine may be established.

1st, That medicines showing considerable powers with respect to the whole system, act especially or only on the stomach. will appear from all those cases in which the effects appear soon after the substance has been taken into the stomach, and before they can be supposed to have gone further into the body, or to have reached the mass of blood. Thus, *Sir John Pringle*, from the sudden operation of the Peruvian bark in preventing the paroxysms of intermittent fevers, properly concludes, that it cannot be by its antiseptic powers with respect to the fluids, but by a certain operation immediately upon the stomach. See *Diseases of the Army*, Appendix, p. xxv.

2dly, As medicines are commonly in the first place applied to the stomach; so all those of volatile, active, and penetrating parts, must immediately and especially act upon the stomach: and from this consideration, as well as from the suddenness of their effects which commonly appear, we may conclude their action to be upon the stomach only. Accordingly, I conclude that the action of the volatile alkali, and some other saline substances, is upon the stomach alone, and very rarely by any antiseptic powers with respect to the fluids.

3dly, Though medicines do not to the taste or smell discover any volatile or active parts, yet if their effects depend upon the change which they produce in the state of the nervous power, it is hardly to be doubted that they operate only upon the sensible and irritable parts of the stomach. This I conceive to be the case of opiates and of most other narcotic powers, whose substance is known to remain in the stomach long after they have discovered their effects in the most distant parts of the system.

4thly, If there are medicines supposed to act only when they come in contact with the parts they are supposed to act upon, and that a certain quantity is necessary to be applied to these parts; and further, if such medicines are either thrown into the stomach in small quantity, or are of a nature to be slowly dissolved there, so that they cannot be supposed in sufficient quantity to come in

contact with the parts they are destined to act upon, whilst however their effects appear on these parts; it must, I think, be concluded, that these effects depend entirely upon the operation of those medicines upon the stomach. This, if I mistake not, applies to the case of most vegetable aringents, and perhaps to the fossil also, whose effects, and especially their sudden effects, upon distant parts of the system, can only be accounted for by their operation upon the stomach.

5thly, Another circumstance leading us to suppose that medicines act immediately upon the stomach, and by their operation there, affect the rest of the system, is the consideration of all those cases where they affect the system very generally, while at the same time they act both suddenly and in small quantity, and therefore in circumstances which cannot allow us to suppose that they are conveyed in substance to the parts in which their effects appear. Thus, as has been observed above, medicines which act very generally upon the nervous system, upon particular parts of it remote from the stomach, cannot be supposed to be transferred in substance to the whole, or even to the particular parts of that system; and therefore must necessarily be supposed to act in the stomach only. Not only, however, with respect to the nervous system, but also with respect to the sanguiferous, any very general effects produced there, as for example a sweating excited universally over the whole body, can be produced no otherwise by internal medicines excepting by such as act on the stomach, and from thence communicate a stimulus to the heart and arteries. In many cases of increased evacuation, it is indeed pretty evident that the medicines exciting the evacuations are actually conveyed and applied to the secretories or excretories of the parts concerned; but this cannot possibly be supposed with regard to sweating, not only from the small quantity of medicine employed, but perhaps also from the nature of the excretion, which is certainly not depending upon glands and their excretories.

6thly, Another circumstance inducing us to suppose medicines to act only on the stomach, is that of their being capable of being changed by the assimilating powers of the stomach and intestines; for such medicines, if they act at all, must act immediately upon their entering into the stomach, or before they are changed by digestion.

It is true, with respect to vegetables, and also certain animal substances, it is often a certain portion of them only that can be subjected to our digestive powers, while the medicinal part of the same is hardly affected; and therefore it may be alleged, that their operation on the interior parts is not prevented by the powers of digestion. This indeed does certainly sometimes happen: but still as digestion breaks down very entirely the texture of vegetables, and evolves the several parts of them more entirely than they were in the entire vegetable, it thereby gives them an opportunity

of acting immediately upon the stomach and even may thereby prevent their activity from reaching beyond this organ.

7thly, Another circumstance which confines the operation of many medicines to the stomach, is the suffering a change there, if not by digestion at least by mixture.

It appears to me very clear, that all animals who take in a quantity of vegetable aliments, and therefore in man there is an acid, and commonly in considerable quantity, very constantly present in the stomach. It is therefore probable, that all alkaline substances are more or less neutralized here; and that consequently, if they act at all as naked alkalines, they can act only upon the stomach before they are neutralized. It appears, however, that alkaline substances frequently prove powerful medicines with respect to the remote parts of the system and I think it must be concluded that their effects must be imputed to their being changed into neutral salts in the stomach, and operating in the other parts of the system as neutrals only; or perhaps their operation may be that of their changing the nature of our fluids, by their abstracting a considerable portion of the acid which should have entered into the composition of these fluids.

On this subject of the changes which substances undergo in the stomach, it is to be observed that the acid of the stomach operates in this respect in two ways.

1st, The acid may be applied to compounds, consisting of an alkali, and another part which has a weaker attraction to the alkali than the acid of the stomach. In such case, the acid of the stomach is joined with the alkali, and throws loose the substance before joined with it, so that the compound can no longer act in the form in which it was thrown into the stomach; and this I think happens with respect to all soaps taken into the stomach; and which therefore cannot have any of the effects which their saponaceous form has been supposed to produce with respect to our fluids.

Another effect of a like resolution by the acid of the stomach, is, in the case of neutral salts formed of an alkali with the acid of tartar; which, with respect to alkali, seems to have a weaker attraction than the acid of the stomach. It is therefore that we are so often disappointed of the operations of soluble tartar; and if we are not, it must be imputed to the neutral formed of an alkali with the acid of the stomach, being as powerful a laxative as the acid of tartar.

2dly, There is another case in which the acid of the stomach acts, and that is when it is applied to certain earthy and metallic substances, which are not soluble in our fluids, and are therefore, with respect to our bodies, perfectly inert; but by having the acid of the stomach applied to them, they are often changed into very active medicines; as we know with respect to the magnesia alba, and to several preparations of antimony and mercury.

CHAPTER II.

*Of the several Means of learning the Virtues
of Medicines.*

WE have already said, that mankind very early became acquainted with the medicinal virtues of some substances not employed in diet; and we can easily conceive in what manner such knowledge might be acquired, although we cannot apply our conjectures on this subject to particulars, and hardly at all to the many particulars that seem to have been very early employed by the practitioners of physic. It may naturally be supposed that these practitioners, intent upon increasing the number of remedies, might, by accidental observation, by random trial, or as guided by some analogy, discover new remedies, and thus increase their number, and retain those especially which experience seemed to confirm.

Upon this footing it has been alleged, that the numerous remedies mentioned by *Dioscorides* and other ancient writers, were entirely the fruits of experience. But from what we have said in our History, and what we shall hereafter say respecting the fallacy of experience, it will be very evident, that as to most of the medicines employed, experience has had a very small share in establishing the virtues which have been commonly ascribed to them. Those disappointments in practice which have so frequently occurred from following the ancients, have very properly engaged modern physicians to seek for means not only of ascertaining more exactly the virtues of the medicines in use, but likewise for investigating the virtues of substances before untried.

For this purpose the chemists made the first attempts; and *Paracelsus* introduced the absurd notions of astral influences and of signatures; while succeeding chemists have suggested the utility of a chemical analysis. The two first of these have been now long ago absolutely exploded, though their effects have not yet entirely disappeared in the writings on the materia medica. The third means of a chemical analysis, though not entirely useless, does not go a great way for the purpose we are enquiring after.

The means which at present are more especially resorted to and cultivated, are those taken from Chemical Examination, from Botanical Affinity, from Sensible Qualities, and from Experience; and the application of each of these I shall now consider with all possible attention.

ARTICLE I. *Of the Use of the Chemical Resolution, in investigating the Virtues of different Substances.*

When the employment of chemical remedies became first considerable in the hands of *Paracelsus* and his followers, it was

accompanied with such visionary and absurd theories, as quite confounded, and greatly corrupted the doctrines of the *materia medica*; but in progress of time chemistry corrected its own errors, and has come at length to be of the greatest utility in improving the *materia medica*. It has done this, by ascertaining more exactly the qualities of the medicines before known and employed; and in particular it has not only relieved the *materia medica*, by rejecting the inert and superfluous, and by marking the degree of qualities in similar substances, but it has directed to a more judicious choice of these. Besides thus correcting and improving the ancient *materia medica*, it has certainly given a valuable new one, by the many new productions which it has discovered, and by the preparations it has invented or improved. Almost the whole of the saline substances taken from the three kingdoms, are the fruits of chemistry; and the inflammable matters, except the expressed oils and a few fossil substances, are also the productions of the same art.

Such have been the advantages obtained from chemistry in affording many, and some of the most efficacious particulars of the *materia medica*; and to the choice and proper use of the whole, an accurate knowledge of chemistry is absolutely necessary.

It has, however, been also supposed, that this art has actually been, or might be, useful in investigating the virtues of vegetable and animal substances; although it does not appear to me to have been in this particular successful. What has been called the Chemical Analysis, or the distillation of substances without addition, has not answered the expectations entertained of it. After many very competent trials, it is now agreed, that such an analysis affords no correct nor certain information concerning the constituent parts of mixts; and the application of this kind of resolution, therefore, is now entirely, or at least very much neglected.

The chemical resolution now attempted, is that which is supposed to separate the parts of mixts without changing or much altering their nature. Thus, by a distillation of plants with water, we obtain their oils very entirely separate from their other parts, and in such condition as we suppose them to have existed in the living plants. By the application of different menstruums, under different degrees of heat, we suppose that we separate as soluble in these different menstruums, parts which existed in the same state in the entire plant; although such a supposition in many cases is to be doubtfully admitted, as in the sequel we shall have occasion to remark. But however this may be, we must here observe, that by these practices it is seldom that we discover virtues unknown before, and commonly only find out in what part of the substance, the virtue otherwise known more especially resides. By such resolution, indeed, we may upon some occasions find a virtue, that in the concentrated state in which it is obtained, is more

considerable than it was as diffused in the entire plant; and sometimes we may seem thereby to find an entirely new medicine: but I hardly know any instances of this, or of our thus investigating virtues not known before. It is possible indeed, that by our finding virtues lodged pretty constantly in parts separated by peculiar menstruums, we may have an analogy leading us to suppose like virtues in the substances which we find to be extracted by like menstruums; but this analogy is very seldom applicable. For example, although we should find the purgative virtue of plants to be commonly residing in the resinous parts of them, we cannot conclude that a plant which yields a resin to a spirituous menstruum is therefore of a purgative quality; and I will venture to assert, that the analogy drawn from chemical resolution goes but a very little way in investigating virtues.

Here, however, it would be improper to omit acknowledging the great utility which has been derived from the labour that has been bestowed in examining the various subjects of the materia medica by the solution of them in the different menstruums. These labours have certainly ascertained the proper pharmaceutical treatment of many substances, and have thereby very much improved our knowledge of the materia medica, especially with respect to the preparations and compositions which form so considerable a part of it.

I have thus acknowledged the general utility of these labours, and shall have occasion in another place to say, to what extent they are more particularly useful.

ARTICLE II. *Of the Use of Botanical Affinities in ascertaining the Medical Virtues of Plants.*

It has happened, I think unfortunately for the materia medica, that the botanists have deemed it incumbent upon them not only to distinguish plants from one another, as was their proper business, but also to point out their medical virtues; a task to which they were often very unequal. They have, however, commonly attempted it; and have done it in the most imperfect manner; for they have commonly compiled merely from preceding authors with very little choice or judgment, and have thereby only multiplied useless and erroneous writings.

This is truly the state of their labours on particular subjects; but the latter botanists have thought of much more extensive application of their science; as they have attempted to apply it very generally to ascertaining the virtues of vegetables.

When the botanists found that vegetables, by a similarity in the parts of their fructification, might be arranged under certain genera, orders, and classes, this arrangement established what I call their Botanical Affinities. This affinity has been shown to apply in a considerable degree to a great number of vegetables,

though not yet to the whole of them; but wherever it has been applied to orders and classes, so as to show a very great similarity and affinity amongst all the several species comprehended under them, these are properly considered as natural orders or classes.

After these natural orders came to be properly established, the botanists came to perceive that where a great botanical affinity took place, there was generally also a remarkable sameness or affinity, amongst the several species with respect to their medical virtues.

This in general was well founded; and such a medical affinity does actually take place, not only in the species of the same genus, but also to a great degree in the species of those orders and classes which may be properly considered as natural. This gives an analogy whereby we may very often presume that an untried vegetable is of the same nature and qualities with those of the same genus and order to which it is related by a botanical affinity.

This is truly to a certain extent just, and applicable with some advantage; but it is by no means so universally applicable as the botanists would seem to insinuate, as there are every where many exceptions to be found.

Even in the species of the same genus, there is often a great difference of qualities in the different species. The *cucumis melo* is very different in its qualities from the *cucumis colocynthis*.

In the natural orders, the exceptions are every where still more considerable. In some of these orders, which consist for the most part of the mildest vegetables, there are sometimes those of a deleterious kind; and in certain orders, which consist of the most active and powerful substances, there are those of a very inert and mild kind. The *lolium temulentum* among the gramina is an instance of the first assertion; and the *verbascum* among the *Luridæ* or *Solanaceæ*, is an instance of the second.

Another observation to be attended to in employing the general analogy is, that though the plants of the same order may have a great resemblance in the general quality, they have this in such degrees, as by no means to admit of an indifferent choice for the purpose of medicine.

A further observation, and of still greater importance, is, that although there is some resemblance in the qualities of the plants belonging to the same order, yet in the several species the resemblance is not only seldom exact, but more commonly there is a peculiar modification in each: and very often with the quality belonging to the order, there is associated another, which is totally different either from that, or from any other of the order, and sometimes of a dangerous kind; so that the heedless practitioner might be very much deceived in trusting to a botanical affinity alone.—It still farther merits attention, that though plants of

the same natural order have commonly the qualities belonging to the order similar in all their several parts, yet this is by no means universal. Plants in general have the qualities of their several parts considerably different, so that the root is often of a very different quality from that of the leaves or seeds; and the resemblance that may be in the fructification, which especially establishes their botanical affinity, is by no means to be extended to all the several parts of the plants agreeing in that affinity. In their several parts, the common quality may not only be in very different degree, but in some of the parts there may be a widely different and even a contrary quality.

From all these considerations, it will readily appear, that the botanical affinity of plants, though it may be of some use in investigating their medical qualities, cannot be applied to ascertaining these virtues but with a great deal of caution; and never can afford any certain conclusion without examining at the same time their sensible qualities; nor even then, except when the supposed medical virtue is confirmed by actual experience on the human body.

ARTICLE III. *Of the Consideration of the Sensible Qualities of Substances, as pointing out their Medical Virtues.*

Another means proposed for judging of the virtues of different substances is, by attending to their sensible qualities of taste, smell, and colour. As we have already remarked that the operation of medicines is chiefly on the nervous system, so that as the sensations of taste and smell depend upon an action of certain substances upon the nerves of the tongue and nose, and their effects are very often from thence communicated to the rest of the body; so it may in some measure be presumed, that those actions on the organs of taste and smell may be communicated to the whole of the nervous system, or may shew an analogous power with respect to the system when applied to the other nervous parts of it.

Upon this, indeed, I rest so much, that I presume very confidently to give it as a very general rule, that those substances which do not at all affect the taste or smell, and even those which affect these organs in a slight degree only, may be considered as inert and useless; and that all such substances should be rejected from the lists of the *materia medica*, excepting a very few, which, though without sensible qualities, may, on this very account, be of a nourishing, emollient, or demulcent quality.

Although physicians have not sufficiently attended to this general rule, they have, however, at all times, from substances being endued with sensible qualities, presumed upon their activity in the human body; and from the state of their sensible qualities have formed a judgment of their medical virtues. It has indeed almost always happened, that from a similarity of taste and smell

in different substances, physicians have been ready to suppose a similarity of virtues.

Such a supposition, indeed, is in many instances well founded: but it has been carried too far; as a similarity of taste and smell in different plants has been supposed to point out with some exactness the same medical virtues. *Sir John Floyer, David Abercrombie, Hoffman*, and several others since their time, have, upon this plan, given systems of the whole materia medica.

In the sequel, I shall have occasion to make many applications of the general doctrine, and shall endeavour to show how far it may be justly carried: but at the same time, it is very proper here to be at some pains in pointing out the fallacy that attends the universal application of it. In the first place, there is a considerable difficulty in ascertaining the difference of tastes in different substances. There are some, such as the acid, the sweet, the bitter, and the styptic, which can be very well distinguished from one another, and about which mankind are generally agreed: but there are many other tastes which cannot be comprehended under any one general head. It appears to me that some general heads have been attempted, if not improperly, at least to very little purpose. Thus it has been common to make a general class of tastes under the title of Acrid: but this term expresses the force of impression rather than any particular sensation; and it has always comprehended substances of otherwise very different qualities, which we shall consider more particularly afterwards under the head of Stimulants.

Another title employed with no better success, in forming a class of tastes, is the Nauseous; which is manifestly too general, as comprehending many which in general have a disagreeable, but at the same time a peculiar taste; in other words, one different from any another, and therefore not to be brought under any general title. It is obvious, likewise, that the class of nauseous tastes comprehends many substances of very different virtues; and this must always give an insuperable difficulty in arranging virtue according to taste.—Besides the general tastes, which we have said are tolerably well ascertained, there are many combinations of these, which give a variety of tastes not to be exactly ascertained, nor always, so far as we yet know, to be taken as a mark of particular virtues.

But further, when we have collected a number of substances under any one of the general classes of tastes, we find the individuals possessing very different degrees of the same quality, and thereby of very different powers. In many instances, indeed, where the quality of the class is prevalent in a plant, it has at the same time joined with it other qualities which give it different virtues from those of the general class. It is needless, however, to insist further here on the fallacy of the general doctrine; because we shall have frequent occasion hereafter to take notice of it, and to

point out the many exceptions with which it is to be received.—Bodies which give out a strong scent, whether agreeable or disagreeable, seem to be peculiarly fitted to act upon our nervous system: and some very powerful medicines are remarkable for this quality. *Linneus*, however, carries the matter too far, when he maintains, that odorous bodies act upon the nerves only, whilst sapid bodies act upon the muscular fibres only; for it is evident that sapids act also, and sometimes very powerfully, upon the nerves.—Whatever may be in this, I go on to observe, that the judging of the virtues of plants from their particular scent, is liable to still more fallacy than the doctrine of tastes. Scents are of greater diversity than tastes: and it is still more difficult to reduce them to any general classes. Indeed it does not occur that any other general division can be made of them, than that of the agreeable and disagreeable. It is true that each of these comprehend a great variety, but not to be assorted with any precision under general heads. *Linneus* has attempted this; but it is enough to look at his general titles, and his enumeration of plants under each, to perceive that they give no precise ideas, nor point out any common qualities, but what arise from the general terms of agreeable and disagreeable; and that even these are considerably diversified in respect of power, and very often show different effects according to the difference of the persons to whom they are applied. The analogy, therefore, afforded by odours is of exceeding little use in illustrating the materia medica.

Linneus, when he alleges that the virtues of medicines may be known from their sensible qualities, does, besides the taste and smell, suppose that the colour likewise may give some indication of virtues; and accordingly he has the following paragraph: “*Color pallidus insipidum, viridis crudum, luteus amarum, ruber acidum, albus dulce, niger ingratum* indicat.” But nobody possessed of the smallest knowledge of plants can miss to mark so many exceptions to each of these, as to perceive that the attempt to establish such general positions is extremely frivolous and useless.

ARTICLE IV. *Of acquiring the Knowledge of the Virtues of Medicine by Experience.*

An experience of the effects of substances upon the living human body, is certainly the only sure means of ascertaining their medical virtues. But the employing of this experience is extremely fallacious and uncertain: and the writers on the materia medica abound with numberless false conclusions, which are however supposed or pretended to be drawn from experience. Such, indeed, is the state of this matter, that nobody can consult those writers with any success or safety, unless he is prepared with a great deal of scepticism on the subject; and it has been owing to want of discernment in this matter, that the writers upon it have compiled one after another so many particulars that are frivolous

and false. It may be useful, therefore, to students, if we here point out the many mistakes and falsehoods which seem to have been drawn from pretended experience.

The first instance to be given of this, is with respect to those supposed remedies, which, both from their nature and from their being placed at a distance from the human body, cannot be supposed to have any action upon it. Such are the various charms, superstitious practices, sympathetic powers, and inodorous amulets, which have been formerly employed. These are indeed in the present age very generally neglected; but it serves sufficiently to show the fallacy of experience, that formerly those remedies had numerous testimonies in their favour. *Mr. Boyle* thought he had seen with his own eyes the operation of the sympathetic powder: and he had the testimony of divers physicians and other sober persons in its favour. It is not necessary at present to give other instances of this; but if it were proper to do it, we would refer to the second volume of the *Acta Naturæ Curiosorum*, Observation 195, a collection of old women's tales, countenanced by the publication of them by a learned society within these forty years. Here is a specimen, Art. xxi. *Lactis abundantia et defectus*. "Pro certo affirmarunt mihi nuper matronæ binæ prudentes et honestæ se in seipsis efficaciam seminis nigellæ multoties expertas esse; quod nempe retro appensum lac abundans discussisset, antrorsum autem auxerit." It is indeed to be regretted, that such remedies are not yet every where sufficiently exploded, when we find so eminent a practitioner as the late *Mr. De Haen* showing some faith in the verbenæ employed as an amulet. But a person who, like him, believed in magic, must have been exposed to every superstitious fancy.

Another instance of false experience I would give, is with respect to the virtues imputed to several substances, which, though taken into the body, pass through it quite unchanged, and are absolutely inert, as they are neither soluble in our fluids, nor endued with any qualities that can operate upon either the solids or fluids of our bodies. Such are the various *Silicious* bodies, from mountain crystal to the gems or precious stones which have formerly had a place in our dispensatories; and which, though now expunged from the British, do still hold a place in many others. Their virtues are still supposed and mentioned by materia medica writers; and when the late *Mr. Vogel* supports the virtue of mountain crystal from his own experience, I have no doubt of his having been deceived in his experiments.

To give a third instance, whenever to substances obviously inert, or such as have little power in changing the human body, and such as are every day taken into it in considerable quantity, without producing any sensible change, we find considerable effects imputed, it may be held to be a mistaken experience. Thus, when the excellent *Linnaeus* tells us that he preserved himself from

the gout by eating every year plentifully of strawberries, I am persuaded that he was deceived by a mistaken experience. It is indeed surprising that this eminent person should have been exposed to such a fallacy; but in the writings on the materia medica, there occur hundreds of such fallacies under very respectable names.

In almost all the writings upon this subject, many virtues have been imputed to substances either absolutely inert, or possessed of sensible qualities in a small degree only. These virtues, indeed, are often supposed upon a pretended experience; but practitioners have so clearly discovered the fallacy of this, that now for a long time past they have been neglecting more and more these inert and impotent substances. The catalogues of the materia medica have been constantly diminishing in the successive editions of our dispensatories; and it has been chiefly by the omission of those useless substances. This, however, in the most part of them, has not gone so far as perhaps it might have done; and here a long list might be given of such as seem to be improperly retained: but we abstain from this at present, as we shall have occasion to do it more properly with respect to most of the particulars hereafter.

A fourth instance of false experience, is when medicines are said to have cured diseases, or to have corrected circumstances of the body, which never existed. An example of this is, when medicines are said to have corrected an *atrabilis*; a state of the fluids, which all the reasoning of *Dr. Boerhaave* cannot persuade me, to have ever taken place in the human body. It seems to have been a pure hypothesis of the ancients, who were by no means in a condition to judge properly of such matters.

I am inclined to judge in the same manner with respect to the lentor or preternatural spissitude of the fluids, so commonly supposed by the moderns. That no such morbid spissitude can ever occur, we would not positively assert; but there is hardly in any case evidence of its having actually taken place: and it is probable that in ninety-nine cases of a hundred in which it has been supposed, it is a mere hypothesis. Considering both this and the false theory with respect to the operation of the medicines supposed to cure it, there can be little doubt in asserting, that it affords many instances of a false experience adduced by writers on the materia medica.

Another example of the same kind occurs with respect to *alexipharmics*, so frequently mentioned. For, not to mention the doubts that might be raised, in many cases of fever, concerning the existence of a morbid matter, and the doubts also with respect to the cure of fevers as depending upon the expulsion of such matter, it may be alleged, that not only the doubtful existence of their object, but also the want of any clear evidence of their operation, gives every reason to believe that the alexipharmic powers reported by

writers, are, for the most part at least, instances of a false experience.

A fifth instance of a false experience adduced, may be found in many cases where a disease does actually take place; but where the operation of the medicines supposed to cure it, is, so far as we yet know, extremely improbable. One example of this seems to be the supposed solution of a stone in the bladder by medicines taken in by the mouth. It is very doubtful if any such medicines are yet known to physicians: but not to enter into the disputes that have lately occurred, and which may still subsist among physicians upon this subject, it is very probable that in many instances of such a power, reported both by ancient and by modern writers, they afford many examples of a greatly mistaken experience.

Under this head may be mentioned the reports of the effects imputed to medicines, which, though not impossible are, however, from our late experience, rendered very improbable, at least in the many instances in which they have been alleged. An example of this, which may be given, is with respect to medicines supposed to promote the menses in the female sex. That there are medicines having such a power, is hardly to be denied; but practitioners have been often disappointed in the employment of the medicines said by the writers on the *materia medica* to have had such a power; and I have had many of the most eminent practitioners of these days giving me this report. There is, however, hardly any virtue more frequently ascribed to medicines than this in the *materia medica* writers; and it may therefore be asserted, that in few cases those writers have had it ascertained by any proper experience.

Another example of the same kind that may be alleged, is with respect to medicines said to promote urine. That there are medicines of such a power, every body knows; but at the same time every practitioner will allow that it is an effect which he often fails of producing, though employing the remedies recommended for that purpose by *materia medica* writers: and it may be suspected, that in very many of the instances in which they ascribe this virtue to medicines, they have proceeded upon a false experience, or perhaps upon none at all.

But if the emmanagogue and diuretic powers have been so often falsely ascribed to medicines, this will be more readily admitted to be the case with respect to those alleged to promote the birth of children; and more certainly still with respect to those said to expel the secundines or dead fœtuses. Such medicines have entirely lost their credit with modern practitioners: and if an overweening partiality to the ancients, who so frequently report such virtues, can believe that they were guided by experience, there can be little doubt in alleging that they have given us numerous instances of a false one.

A sixth instance, and a very fruitful source of false experience, is, when effects that do really take place, are imputed to medicines employed, while they are truly owing to another cause; and particularly when effects imputed to medicines do truly proceed from the spontaneous operations of the animal œconomy, or of nature, as we commonly speak. It is hardly necessary to give as an instance of this, the exploded opinion concerning the reunion of fractured bones, which was formerly supposed to be promoted by certain medicines; but is now universally considered as an instance of false experience, as the effect is now judged to be entirely the operation of nature.

This perhaps might have been passed over; but it would not have been so proper to omit taking notice of an instance of the same kind which is still to be found in almost every materia medica writer. It is the imputing to medicines taken in by the mouth, the power of promoting the cure of wounds; and accordingly a very great number of vegetables are still mentioned under the title of Vulneraries. This virtue seems to be very often ascribed to medicines, when hardly any other could be ascribed to them.

It seems to be very generally supposed at present, that the cure of wounds is entirely or chiefly the work of nature; and, if accidental circumstances should not occur to hinder it, that nature will constantly do the business. So far are British practitioners persuaded of this doctrine, that it is extremely unusual for any of them to employ any internal medicine under the title of Vulneraries, or to proceed upon the supposition that any internal medicines can assist in the common cure of wounds. It is indeed possible, that a certain flaccidity of the parts affected, may retard the suppuration of wounds, or may dispose them to gangrene; and in such cases our practitioners employ internally the Peruvian bark; but it is the only vulnerary they use. And although in the list of vulneraries given by writers, there may be some medicines which might have an operation analogous to that of the bark, yet I believe this was not at all perceived by the practitioners who formerly employed them: and it is very probable, that the most part of the particular vulneraries recited had little power of any kind; and certainly nothing was to be expected from the injudicious and absurd compositions that were offered under that title.

In how many instances the effects of the operations of nature have been falsely imputed to the operation of medicines, need hardly be said. From the first beginnings of physic to the present day, it has been generally supposed that many diseases are cured entirely or chiefly by the operations of nature; and that many of the cures supposed to be effected by medicine are often effected by nature alone, or perhaps either by accidental occurrences taking place in the animal œconomy, or by certain external circumstan-

ces which have accidentally occurred; and therefore, that in innumerable instances the effects of medicines pretendedly founded on experience are often mistaken and false. How often this has happened, or how often it has occasioned mistakes in the writings of the *materia medica*, it is not necessary to say here. It will, however, be allowable to take notice of one instance, that has, I believe, occurred in almost every writing upon the subject. This is with respect to the jaundice; a disease taken notice of in all ages, but whose nature has been understood only in very late times, and so lately that even *Dr. Boerhaave* understood it very imperfectly. It seems to be now very generally agreed, that the disease is never owing to the interrupted secretion of bile, but always to the after interruption of its passage from the liver to the duodenum.

Whether the jaundice may be produced by a reabsorption of bile that has been copiously poured into the intestines, as some physicians have thought, I would not positively determine; but am disposed to believe, that the interruption of its passage already mentioned is very universally the cause of jaundice, by the reabsorption or regurgitation of the bile accumulated in the biliary ducts passing into the blood-vessels. The interruption mentioned may be owing to different causes; but it is sufficient to our present purpose to remark, that in ninety-nine of a hundred instances of the disease, the passage of the bile is interrupted by biliary concretions formed in the gall-bladder, and falling down into the *ductus communis*; and that it has especially been in cases of this kind that various medicines have been supposed to cure the jaundice: but all of them may perhaps be considered as instances of false experience. We know of no medicines capable of dissolving biliary concretions, that can be conveyed into the body so as to reach these concretions, as they exist in the *ductus choledochus communis*; and of a hundred medicines which have been reported to have cured the jaundice, there is not one of them that we can conceive to have either the power of dissolving the concretion, or of expediting its passage into the duodenum. These reports, therefore, of their curing the disease, may be considered as so many instances of a false experience. They have been commonly owing to the fallacia *causæ pro non causâ*. The membranes of the human body readily admit of a gradual and considerable extension; and therefore the coats of the *ductus choledochus* often suffer such a dilation as to allow biliary concretions to pass into the duodenum. When this happens, it very soon puts an end to the appearance of jaundice. If, however, at the same time, a person labouring under the disease had been for some time using a medicine recommended for it, the cure is imputed to this; though, for the reasons given above, it could not truly have any share in it.

A seventh instance of false experience is that which has arisen

from mistakes concerning the nature of diseases, which, though similar in certain circumstances, are, however, in their nature considerably different. Thus, in materia medica writers, there is nothing more common than the mention of the same remedy for the cure of diarrhœa and dysentery. As astringents they may be useful in the former; but in the latter, especially in its beginning, they are not only useless, but improper and pernicious. When, therefore, they are reported from experience to have cured the latter, it seems to have been either from supposing a case of diarrhœa to be that of a dysentery; or, at least from not attending to the circumstances of the case, and from giving that as a general remedy, which is adapted only to one particular circumstance of the disease. This is a mode of writing on the materia medica, which has introduced great confusion and many pernicious mistakes into the practice of physic.

The eighth and last instance of false experience that I shall mention, is that which has arisen from mistakes concerning medicines. Thus, modern writers have ascribed virtues which they have copied from *Dioscorides*, to medicines which are very different from those to which the ancient writers had ascribed them, though still vouched by the pretended experience of the moderns.

From this view of the many instances of false experience adduced by writers on the materia medica, and which instances are to be found in almost every writer on the subject, it will appear that these writings are for the most part a compilation of mistakes and falsehoods, against the imposition of which a student should be very much on his guard. It indeed requires more knowledge, discernment, and experience, than the student at the time he commonly enters upon his study can possibly have. But it may be of use to inspire him with general doubt and diffidence; and it is hoped, that the remarks we have taken the liberty of suggesting, may be in some measure useful both to teachers of the materia medica, and to physicians engaged in the practice of physic.

Before dismissing this subject, it is incumbent upon me to observe, that the writers upon the materia medica have reported the false experiences mentioned, chiefly from their mistaken judgment, and rarely under any consciousness of falsehood. But it must, however, be acknowledged, that this last has also unhappily taken place, and that many facts have been obtruded upon the public by persons conscious of their being false. This has happened sometimes from an attachment to particular theories, which their authors have desired to maintain, and have therefore often supported by pretended facts and experiments. Sometimes the same effects have been produced by an attachment to a particular method of cure, or to particular remedies which their authors supposed they had discovered or invented, and which they have often supported by facts, which perhaps their prejudices have made them suppose to be true, but which they have admitted

without rigorous examination of their truth, and sometimes conscious of their falsehood.

This leads me to observe, that a very fertile source of false facts has been opened for some time past. This is, in some young physicians, the vanity of being the authors of observations, which are often too hastily made, and sometimes, perhaps, very entirely dressed in the closet. We dare not, at present be particular: but the next age will discern many instances of perhaps the direct falsehoods, and certainly the many mistakes in fact, produced in the present age, concerning the powers and virtues of medicines.

I have now said enough of the falsehoods which have prevailed or may further prevail, in writings on the *materia medica*.

But, upon this subject of the investigation of medicinal virtues by experience, I must still remark, that there are several kinds of experiment which have been not very fitly employed for the purpose. One is, the giving the substances to brute animals, and observing their effects upon these. This is a very proper measure in the investigating the powers of all untried substances, and may give a proper caution with regard to the trial of the same upon the human body; but it can go no farther: for it is well known that the effects may be very different in the two subjects, as some substances act much more powerfully, and others more weakly, upon the human body, than upon those of brutes: and therefore we can draw no certain conclusion from the effects of substances upon brute animals, till they are actually tried upon the human body.

Another mode of experiments for ascertaining the virtue of medicines, has been by mixing them with the blood immediately drawn out of the vessels. This has given us some knowledge of the nature of our fluids, and of the effects of some substances mixed with them in this manner. Perhaps some general conclusions may be drawn from these experiments. But *materia medica* writers have often drawn conclusions from them, without attending to the difference that may arise from the changes which many substances undergo in the first passages, before they are mixed with the blood; and without considering the difference between the quantities applied in these experiments to a small portion of the blood, and of the quantities that can possibly be introduced by the mouth, and which are to be diffused in the whole of the mass of blood. In consequence of this, many erroneous judgments have been given by writers on the *materia medica*; as I shall mention hereafter on the subject of the particular medicines with respect to which these false judgments have been given.

A third mode of experiment, employed for investigating the virtues of medicines, has been by cjecting them into the veins of living brutes: and such experiments have been frequently made, but have afforded very few conclusions or certain instruction. Whatever are the effects of substances applied in this man-

ner, they must be very different from what they would be if introduced into the body by the mouth; when, by the changes they may suffer in the first passages, and especially from the dilution and diffusion which they necessarily undergo there, they cannot possibly have the same effects as when injected into the vessels. It is proper also to remark, that the effects which have generally occurred in consequence of injections into the vessels of brutes, and particularly the coagulation produced by almost every thing thrown in, will, it is believed, long prevent our trying this mode of the application of medicines to the human body.

With respect to both these modes of experiment last mentioned, it must be observed, that the result of the experiments reported is often so contradictory, and such want of chemical knowledge has so often appeared in making the experiments, that at present very few conclusions can be drawn from them.

We have now finished the several subjects which seemed necessary to be considered as an introduction to the study of the materia medica; but before entering upon the particular subjects of it, I think it still requisite to say a few words concerning the plan most proper for a treatise of this kind, or the order in which the several subjects of it may be most properly arranged.

CHAPTER III.

*Of the most proper Plan for a Treatise on the
Materia Medica.*

THE order in which the several subjects of the materia medica have been considered, has been very different in different writers; and which is the most proper, has been disputed about, while many are of opinion that it is of little consequence, which of them is followed. It has generally been thought proper to follow a plan in which the subjects are, according to a certain affinity, brought together, so that a number of them might be for the purpose of medicines considered under the same view. Thus, *Dr. Boerhaave* considered them in the order of the botanical system he had formed; and *Linnaeus* in the order of his own; in which he is followed by *Bergius*. But it will, however, be obvious, that as no botanical system in every part of it collects plants by their natural affinities; so it will only be when such systems have many natural classes and orders, that they will collect the subjects of the materia medica, that are at the same time connected by their medical qualities; and that consequently this principal object cannot be obtained throughout the whole of any system.

It has accordingly been thought proper to follow the botanical affinities, in so far only as these can be thrown into natural orders:

and this, therefore, has been attempted by the learned *Murray*, so far as he has yet proceeded: but from what we have said above, with respect to the imperfection of the botanical affinities in pointing out a similarity of medical virtues, it will appear that this plan will not always unite subjects in the latter point of view: and when we consider, that there are yet many plants which do not enter into any natural order, these must be disposed of in an arbitrary manner, and probably in an unconnected state. It must be owned, however, that though the scheme of botanical affinities does not entirely answer the purpose, yet it will still go a certain length, and ought not to be neglected in the subdivisions of any general plan that may be assumed.

It has been supposed by some to be a very eligible plan to unite the several substances, as they happen to be related by their sensible qualities; and this method *Cartheuser* and *Gleditsch* have attempted. This certainly may have its use; but from what is said above, respecting the imperfection of this scheme for investigating virtues, it will appear that it will not always unite subjects that ought to be united under the same view: and it will be found, that in the authors mentioned, who have executed it in the best manner possible, the desired effect is by no means produced.

From the difficulty of rendering any of these plans tolerably exact and perfect, some writers have deserted all of them, and thought it best to throw the several articles into an alphabetical order, as *Newman* and *Lewis* have done. If, however, there can be any advantage from bringing subjects of some affinity together, this alphabetical order is the most unfit for the purpose, as by separating similar substances, it must be perpetually distracting to the student. It can therefore have no advantage but that of a dictionary, in referring readily to any particular subject that may be enquired after. But this advantage can be obtained in every plan by means of an index, which cannot be saved even in an alphabetical work; as the different names under which the same substances are known necessarily require an index comprehending all those different names.

Similar to those of the alphabetical order, are those plans which, after arranging the several articles of the materia medica according to the part of the plant employed, as roots, leaves, &c. have thrown these again into an alphabetical order, as *Alston* and *Vogel* have done. But it is obvious that this establishes no connection between the subjects that follow one another, and can have no advantage over the alphabetical order. Further, by separating the consideration of the several parts of vegetables, it will both separate subjects that ought to be considered together, and will occasion unnecessary repetition.

After rejecting all these different plans, it will, I think, appear, that as the study of the materia medica is truly the study of the

medicinal virtues, so the plan that arranges the several substances according to their agreeing in some general virtues, will be the best adapted to acquiring the knowledge of these, and will most readily inform the practitioner what different means he can employ for his general purpose. It will also inform him how far the several similar substances may differ in their degree of power, or how far, from the particular qualities assigned to each, he may be directed or limited in his choice.

As it seems proper that every practitioner ought, as far as possible, to practise upon general indications; so it is evident that his study of the materia medica is especially to know the several means that can answer these. Such a plan, therefore, must be the most proper for giving a student instruction; and if while medicines are arranged according as they answer general indications, the particulars be likewise thrown together, as far as possible according to their sensible qualities and botanical affinities, this plan will have the advantage of any other that has been proposed for presenting together the subjects that ought to be considered at one and the same time, and give the best means of recollecting every thing that relates to them.

Such is the plan I am to follow: and I am particularly willing that this treatise of the materia medica should be considered as giving a therapeutice, or *methodus medendi*, from which part of the medical system, the materia medica cannot properly be separated. It may indeed be alleged, that as the therapeutice must be founded on a particular system of physiology and pathology, so it must be liable to all the errors and fallacies of these. But every treatise on the materia medica which refers the virtues of medicines to general indications, must be exposed to the same objections: and though we cannot presume to say, that our plan in this respect shall be without mistakes; yet our general plan in most of its parts being nearly the same with most other systems, we trust it shall not be very faulty. And as it is a principal purpose of this treatise to render the *methodus medendi*, or the establishing of general indications, more correct, and better adapted to the particulars of the materia medica, than it has hitherto been; so it affords a particular reason for our following this plan; which in general is very much the same with that of *Dr. Boerhaave* in his treatise *De Viribus Medicamentorum*, and such as has been followed by several late authors, as *Spielman*, *Loesecke*, and *Lieutaud*.

In following this plan, I shall have occasion to employ some general terms in a sense different from that of other writers: and, therefore, that I may be afterwards more easily understood, it is judged necessary here to give some explanation of these terms: and at the same time, as I shall be frequently obliged to mention also the terms employed by other writers, it is judged necessary likewise to explain in what sense these are to be taken.

To do this properly, I think it may be of service to students of the *materia medica*, if some pains shall be taken here to explain the whole of the general terms employed by writers on this subject.— In doing this, I shall, with respect to each term, endeavour to say in what sense it has been commonly or particularly employed; with what propriety it has been used; why I do not employ it; and very often why it should not be employed at all. For this purpose, I shall throw the whole of the terms into an alphabetical order, and thus give a dictionary which I hope may be useful and convenient for persons entering upon the study of the *materia medica*. In doing this, it seems proper and necessary to give the appellations as employed by Latin writers; and if upon any occasion the explanation of an English term is sought for, it will be readily found by the help of the index placed at the end of the whole work.

DICTIONARY

OF THE *GENERAL TERMS*, EMPLOYED BY *WRITERS*
ON THE *MATERIA MEDICA*.

A

ABLUENTIA, *Abluents*. Medicines suited to wash off from the external or internal surfaces of the body, any matters improperly adhering to them. They are either water or other fluids, which can act by their fluid quality, and may be in the form of lotion, gargarism, or injection. The term of abluent is seldom employed, and more commonly that of *Abstergent* or *Detergent*; and under these titles are commonly mentioned medicines which not only by their fluidity wash off adhering matters, but such also as are supposed to do it by their power of resolving and loosening the cohesion of the adhering matters. In this sense, however, these terms are too general, and therefore ought not to be employed: and when they have been employed with respect to the internal parts, it has generally been upon a false supposition of their power of resolving viscid substances, which we shall hereafter endeavour to show to be commonly mistaken.

ABORTIVA, *Abortives*. Medicines capable of occasioning an abortion in pregnant women. These medicines have been otherwise named *Ambiotica* and *Echolica*; and they are commonly supposed to have also the power of promoting the natural birth, of forcing off the placenta, and even of expelling a dead fetus. These last mentioned powers, though frequently ascribed to medicines by the ancients, seem to me, and perhaps to most physicians of these days, to be imaginary, and accordingly such medicines are now hardly ever employed. There is little foundation for supposing the power of any medicines to be specifically determined to the uterus; and seemingly there are no other

abortiva than such as produce their effects by a violent general operation.

ABSORBENTIA, *Absorbents*. Dry bodies suited to suck liquids into the pores. In this general sense, the term is now very seldom employed; and is almost strictly confined to certain earths suited to take acids in their pores, and at the same time to destroy their acid quality. They will be considered hereafter under the title of Antacida.

ABSTERGENTIA, *Abstergents*. See Abluentia.

ACOPA. Medicines, and particularly unguents, suited to take off the lassitude induced by exercise and labour. The term may be employed for some general measures to this purpose; but I know of no medicines suited to it, except by a general quality, and therefore would admit of no such title to be applied to medicines.

ACOUSTICA. Medicines suited to cure deafness, or other defects of hearing. This is an instance of those general terms which have confounded the materia medica and the practice of physic. As deafness or any other disease, may depend upon different causes, and such as may require different and even opposite remedies, students cannot be properly instructed, unless remedies are pointed out as suited to the particular cause and peculiar circumstances of the disease. It is possible, indeed, that a practitioner may have found a deafness relieved or cured by a certain remedy, when he could neither ascertain the state of the disease, nor the operation by which the remedy was useful; and I would not refuse to mark such facts: but while matters are on that footing, they can only lead to a random empirical practice, which every body knows has been not only useless but frequently hurtful. Such general terms, therefore, as *acoustics*, serve to mislead rather than instruct, and should never be employed.

AGGLUTINANTIA, *Agglutinants*. Medicines suited to cement and reunite soft parts preternaturally separated, and therefore employed in wounds and ulcers: but our British surgeons neither know such medicines, nor employ any supposing them to be such. They suppose the business to be entirely the work of nature, and their own function to be only the removing any impediments that may occur to that.

The term of Agglutinants has also been employed by QUINCY, and perhaps some others, for medicines suited to supply the vacuities formed by the abrasion of the solid parts, either produced by the constant motion of the fluids over them, or perhaps by the motion of the solid parts upon one another; but the supposition of the disease is upon a very doubtful theory, and the supposition of the operation of the medicines is not less so. If the term has any foundation at all, it must be upon the same with that of nutrient; and there is no propriety in employing a doubtful theoretical term.

ALEXIPHARMACA, *Alexipharmics*. Medicines supposed fit to preserve the body against the power of poisons, or to correct and expel those taken into the body. The same are mentioned also under the titles of *Alexiteria* and *Antidota*; and upon the supposition of their being fitted to expel the poison of animals, also named *Theriaca*. In our history of the materia medica, we have said that the study of poisons and of antidotes appeared very early among the physicians of Greece and Rome, and continued to be a great part of their study so

long as the Greek physic lasted; from whence the number of antidotes and theriacas so frequently mentioned in those ancient writers. We have likewise in the same place taken notice of the injudicious compositions by which the ancients attempted the correction of poisons, and with respect to which hardly any body at present doubts of their having been as unsuccessful as they were injudicious; and therefore it may now be said that the terms were very improperly employed.

The modern physicians, however, and particularly the Galenists, adopting very much the ideas of the ancients, have therefore continued their medicines: and the moderns have further transferred the notion from the case of poisons evidently taken into the body, to the case of noxious powers frequently taken in from contagion, or otherwise arising in the body. With regard to these, therefore, they have supposed that the cure of the disease arising from them was to be obtained by the correction and expulsion of the morbid matter: and the medicines suited to this purpose they have often given under the titles of *Alexipharmics* and *Alexiterials*.

How little foundation, however, there is for the greatest part of this theory, I have endeavoured to show in another place. See *First lines of the Practice of Physic*. And whatever may become of my general doctrine, I cannot perceive that the medicines given under the titles of *Alexipharmics* and *Alexiterials* are any ways peculiarly suited to expel morbid matter. In so far as they are anywise suited to that purpose, they are diaphoretics or sudorifics: and as generally stimulant and heating medicines, they are to be employed with great caution. The terms of *Alexipharmic* and *Alexiterial* should therefore be expunged from the writings on the materia medica: for though the medicines enumerated under these titles may be truly useful, their being given under the false idea which the general terms imply, may induce an erroneous practice; and in former times they generally did establish that pernicious practice which cost Dr. Sydenham so much pains and trouble to correct.

ALEXITERIA. See the title of *Alexipharmaca* above.

ALLIOTICA, more commonly named ALTERANTIA, *Alteratives*. Medicines suited to change the condition of the mass of blood, particularly from a morbid to a sound state, and frequently employed for medicines suited not only to correct but to clear the blood from certain impurities supposed to remain in it. With what propriety and in what sense, the term may be employed, we shall in the sequel have occasion fully to explain.

ALOEDARIA et ALOETICA, *Aloetics*. Compound medicines which receive aloes as a principal ingredient.

ALOEPHANGINA. Medicines formed by a combination of aloes and aromatic.

ALTERANTIA. See above *Alliotica*.

ALVIDUCA, *Openers of the Belly*. Medicines suited to promote the natural evacuation by stool, otherwise named LAXANTIA, *Laxatives*. The propriety of such terms, and the limits to be set to them will be fully considered hereafter, in our treatise on the materia medica, under the title of *Cathartica*.

AMBLOTICA. See above, the title *Abortiva*.

ANACATHARTICA. Medicines purging upwards, and sometimes employed for emetics, sometimes for salivants, but most commonly implying, according to the original sense in which the term was employed by HIPPOCRATES, *Expectorants*, or medicines promoting the ejection of matter from the lungs, whether mucous or purulent.—With what propriety and strict meaning the term may be employed, will be considered hereafter under the title of *Expectorants*.

ANALEPTICA, Restoratives. Medicines suited to restore the force of the body when lost, and sometimes employed with respect to stimulants, but more commonly with respect to those substances which supply a deficient nourishment. As a term, however, attended with some ambiguity, it should not be employed at all.

ANAMNESTICA. Medicines supposed to improve the memory, or to restore it when lost. A general title which seems to have no foundation at all, or although it had, would as too general, be very improperly employed. See *Acoustics*.

ANAPLEROTICA. Medicines supposed to supply the loss of substance in the whole, or in particular parts; as in wounds or ulcers. In the former case, it is improper, as of no defined operation; and in the latter case, the surgeons know well how improperly such a general term is employed.

ANASTOMOTICA. A term of the same meaning with that of *Aperientia*; which see hereafter. When, however, the term *Anastomotica* is especially employed, it implies medicines suited to open the extreme orifices of blood-vessels.

ANODYNA, Anodynes. Medicines suited to relieve pain. It might be a general term, comprehending every means of relieving pain, and so far might be faulty; but as now generally employed for those means only which relieve pain by diminishing or destroying sensibility, it may be allowable.

ANTACIDA, Antacids. Medicines suited to correct and neutralize acids. Of how many different kinds these are, and to which of them the term is properly applied, we shall endeavour to say hereafter in our treatise, in which the term again occurs.

ANTACRIA, Antacrids. Medicines suited to correct acrimony, either in the whole system or in particular parts of it. To what medicines this title is properly applied, we shall say hereafter in the following treatise.

ANTALKALINA, Antalkalines. Medicines suited to correct alkaline salts, or alkaline matters in the whole body, or in particular parts. In what sense the term of *Antalkalines* may be properly employed, we shall explain hereafter under that title in the *materia medica*.

ANTAPHRODISIACA, or ANTAPHRODITICA. Medicines supposed to check or extinguish venereal diseases. It is doubtful if there be any medicines of specific power for this purpose; and if there be remedies or medicines which have these effects, it is by answering particular indications, under the title of which only they ought to be mentioned, and not under a general term of no defined operation.

ANTASTHMATICS. Medicines supposed to cure asthma, or in general to relieve difficult breathing. With respect to this and all the

other titles in which the word *anti*, connected with that of a particular disease or morbid function, is employed, the same observation is to be made that was made above under the title of Acoustic.

The meaning of the terms in which the word *anti* is employed may be commonly understood; but for the sake of the unlearned I shall repeat them here, with a short explanation of their meaning.

ANTEMETICA. Medicines suited to cure a preternatural vomiting.

ANTHELMINTICA, Anthelmintics. Medicines suited to poison worms in the alimentary canal, or to expel them from thence. As we cannot always distinguish whether our anthelmintics operate in the one way or in the other, and as several of them may be supposed to operate in both ways at the same time, the general term may for the most part be retained; though it is to be desired that we could distinguish between the proper anthelmintics and the violent purgatives.

ANTHYPOCHONDRIACA. Medicines suited to cure hypochondriasis.

ANTHYPNOICA. Medicines suited to dispel sleep.

ANTICAHECTICA. Medicines suited to cure cachexy.

ANTICOLICA. Medicines suited to cure the colic.

ANTIDINICA. Medicines suited to cure giddiness.

ANTIDOTA, Antidotes. Medicines suited to oppose or destroy the power of poisons taken into the body. See above Alexipharmaca.

ANTIDYSENTERICA. Medicines suited to cure dysentery.

ANTIFEBRILIA. Medicines suited to cure fever.

ANTIHECTICA. Medicines suited to cure hectic fever.

ANTIHYSTERICA. Medicines suited to cure hysteria and hysterical diseases.

ANTILOIMACA. Medicines which preserve against the plague.

ANTILYSSUS. A medicine suited to cure the rabies canina in men or in brutes.

ANTINEPHRITICA. Medicines suited to cure the gravel, or other diseases of the kidneys.

ANTIPARALYTICA. Medicines suited to cure the palsy.

ANTIPHARMACA. Medicines suited to resist poisons.

ANTIPHLOGISTICA. Medicines or remedies suited to resist, diminish, or cure, inflammation, or an inflammatory state of the system.

ANTIPHTHISICA. Medicines suited to resist and cure phthisis or consumption.

ANTIPLEURITICA. Medicines suited to cure pleurisy.

ANTIPODAGRICA. Medicines suited to cure the gout.

ANTIPIRETTICA. The same with Antifebrilia.

ANTIQUARTIUM. Medicines suited to cure quartan fever.

ANTISCOLICA. The same with Anthelmintica.

ANTISCORBUTICA. Medicines suited to cure scurvy; but frequently applied particularly to medicines of the class tetradynamia.

ANTISEPTICA. Medicines suited to resist or correct putrefaction.

ANTISPASMODICA. Medicines suited to cure spasmodic affections. A title certainly faulty as a general one; but it is difficult to reduce it to the particular operations comprehended under it. We shall, however, endeavour to do this afterwards.

ANTITOXICA. The same with Antipharmaca and Antidota.

ANTIVENEREA might be the same with Antaphrodisiaca; but for the most part is only employed for medicines suited to cure the lues venera, or some of its symptoms; and as too general it is certainly improper.

APERIENTIA, Aperients. Medicines suited to open obstructed passages, and particularly to open and restore suppressed excretions or evacuations, and most commonly applied to medicines suited to open the vessels of the uterus, and thereby to excite the retained, or to restore the suppressed, menstrual flux. The term, therefore, as variously employed, but with respect to different cases and to different manners of operating, is, without specifying the particular case and operation, extremely improper. It has farther been too often employed with respect to certain medicines, whose power of answering the purpose proposed is extremely doubtful.

APHRODISIACA. Medicines supposed to be suited to excite the venereal appetite, or to increase the venereal powers. I do not know that there are any medicines of specific power for these purposes; and therefore the term seems to have been for the most part improperly employed.

APOCRUSTICUM. The same with Repellent.

APOPHLEGMATIZONTA, APOPHLEGMATIZANTIA, and APOPHLEGMATICA. Medicines suited to excite the excretion of mucus from the schneiderian membrane: and they are of two kinds; as the evacuation is made from the nose, when they are named *Errhines*; or as the same is made from the mouth, when they are named *Masticatories*.

ARCHEALIA. Medicines supposed to be agreeable to the imaginary archeus in the system of *Van Helmont*. It is a term which has been adopted by the Stahlians upon the most imaginary and visionary footing, but is not likely to be more heard of in the writings of physicians.

ARISTOLOCHICA. Medicines suited to promote the evacuation of the lochia in child-bearing women. The propriety of such a term will be considered hereafter under the title of Menagoga, in its proper place.

ARTERIACA. Medicines suited to relieve the diseases, or promote the functions, of the aspera arteria or trachea. A term conveying no precise meaning, and therefore improper.

ARTHRITICA. Medicines suited to cure the diseases of the joints, particularly the gout. It is a term of so vague and of so undetermined a meaning as to be altogether improper.

ASTRINGENTIA, Astringents. Medicines suited to increase the cohesion, and produce some contraction in the simple solids and moving fibres of the human body. Their manner of operating, and their effects, will be more fully considered hereafter in their proper place.

ATTENUANTIA, Attenuants. Medicines supposed to diminish the consistence of the animal fluids, either by dividing coherent masses, or by diminishing the size of the larger particles. With what propriety any medicines can be supposed to do this, will be considered hereafter; and I expect to show that the supposition is false, and the term therefore improper.

ATTRAHENTIA. Medicines supposed to draw the fluids in greater quantity than usual towards the part to which the medicine is applied. A power that may be fairly supposed in certain medicines; but will be more properly expressed by a term pointing out the operation by which the medicine produces its effect.

B.

BASILICA. A quackish term applied to medicines supposed to be of noble or royal power; but as such terms are suited to deceive, and commonly have deceived the world, they are therefore unworthy of public societies.

BECHICA. Medicines suited to relieve a cough; which as they may be of various kinds, the general term may mislead, and is therefore improper.

BEZOARTICA. Medicines supposed to have the virtues of bezoar, chiefly those of expelling morbid matter. As these, however, supposed peculiar to that substance, were imaginary and ill-founded, so the extension of the term to other substances or preparations is fallacious and improper.

C.

CALEFACIENTIA. Heating medicines or those which increase the heat of the body. Whether there are any of this quality that act otherwise than by increasing the motion of the blood, and therefore by increasing the action of the heart and arteries, will be considered hereafter under the title of Stimulants.

CARDIACA, Cordials. Medicines suited to increase the action and vigour of the heart. This is the strict meaning of the term: but it has been extended to every means of increasing, and especially to those of suddenly increasing, the activity of the system; in which case the term may not have the necessary precision.

CATAGMATICA. Medicines suited to assist the reunion of fractured bones. A power which is not certainly known to exist in any medicines whatever, and therefore the term is falsely employed.

CATHÆRETICA. Medicines suited to cleanse foul ulcers; but as the operation of the different medicines employed for this purpose is not always the same, nor their different operation well explained, the propriety of the general term may be doubtful.

CATHARTICA. Medicines suited to increase the evacuation by stool. The various operation of these, and therefore the various application of the term, will be considered hereafter in its proper place.

CAUSTICA. Medicines suited to destroy the mixture and texture of animal substances. As a metaphorical term taken from the operation of actual fire, it is not strictly proper; but as now universally employed, it may still be allowed.

CEPHALICA. Medicines suited to relieve or cure the diseases of the head. However frequently employed, such a general meaning is enough to shew the absolute impropriety of the term. It has been proposed to limit it to a more precise meaning, and to apply it to such medicines as have the power of increasing the energy of the brain, and the activity of the nervous system; but it has been applied in this manner without any proper distinction and precision; and till we can do this, the term would be better laid aside.

CHOLAGOGA. Purgative medicines supposed to evacuate especially, or as the language is electively, bile; but as such a peculiar power in any medicine cannot be clearly ascertained, the term has been properly long ago laid aside.

CICATRIZANTIA, *Cicatrisers*. Medicines suited to induce a cicatrice, or new skin upon wounds and ulcers. As it is extremely doubtful if such a power in any medicine exists, the propriety of the term may be justly questioned.

CONSOLIDANTIA. Medicines suited to give firmness and union to growing parts in wounds and ulcers.

COSMETICA, *Cosmetics*. Medicines supposed to improve the beauty of the face, or to restore it when any how lost. The indication is to be answered by medicines of different, and even contrary qualities; and therefore the general term is improper, and as such it has done much mischief.

D.

DEMULCENTIA, *Demulcents*. Medicines suited to correct acrids, or to obviate the irritation arising, or that may arise, from them. What are the medicines that may answer this purpose, we shall consider hereafter.

DEOBSTRUENTIA, *Deobstruents*. Medicines suited to remove obstructions which have taken place in any of the vessels of the body. As a general term it is improper; and as commonly employed for medicines which are supposed to remove the obstructions depending upon a matter filling up the vessels, it is commonly upon a false foundation, and therefore absolutely improper.

DEOPPILANTIA, *Deobstruents*. Supposed to act in the manner last mentioned, and therefore upon a very doubtful foundation.

DEPILATORIA. Medicines suited to make the hair fall off from the places upon which it grows.

DEPURANTIA. Medicines supposed to correct or evacuate the impurities which upon any occasion prevail in the body; but as no such specific power can be supposed in any particular medicine, the general term is groundless and extremely improper.

DIAPHORETICA. Medicines suited to excite or promote the insensible perspiration usually made from the skin. The term has often been employed for medicines suited to excite or promote sweat: and there are perhaps no exact limits to be put between the diaphoretica and sudorifera; or, so far as there is, the diaphoretica are employed for those medicines which promote the evacuation only in the insensible form.

DIAPNOICA. A term more strictly employed for medicines which act in the more gentle manner we have just now said of the diaphoretica.

DIGERENTIA and **DIGESTIVA.** Medicines supposed to promote the production of a proper, or, as the language commonly is, a laudable pus, in wounds and ulcers. There are certainly various medicines which seem to answer this purpose; but whether they directly contribute to this, or only correct those circumstances which impede the operation of nature, is a little uncertain; and therefore it is doubtful whether the general term proper be or necessary.

DILUENTIA, *Diluents.* Medicines which increase the fluidity of the blood, by increasing the proportion of fluid parts in it. This is the precise idea of diluents; and if the term be applied to substances, which by other means increase the fluidity of the blood, it seems to be very improperly employed.

DISCUTIENTIA, *Discutients.* Medicines supposed to dispel tumour or hardness. The operation of such medicines seems to be of different kinds, and therefore the general term should, if possible, be avoided.

DIURETICA. Medicines suited to promote or increase the secretion of urine. A term to be more fully considered hereafter.

E.

ECBOLICA. A term of the same meaning with Abortiva.

ECCOPROTICA. Purging medicines of the gentler kind, or strictly, medicines which promote the natural evacuation by stool.

EMETICA. Medicines which excite vomiting. To what different substances the term may be applied, will be considered hereafter in our treatise of the *materia medica*.

EMOLLIENTIA. Medicines which diminish the force of cohesion in our simple solids, and therefore soften and diminish the hardness and rigidity of the parts to which they are applied. Their manner of operating, and how far they operate on the moving fibres, is to be considered more fully hereafter.

EPISPASTICA. Medicines which draw the fluids more copiously into the parts to which they are applied, and therefore strictly a term of the same meaning with that of *attrahentia*; but as the effect of the *epispastica* is commonly that of exciting blisters, the term is often employed for those of *vesicantia* and *vesicatoria*.

EPULOTICA. A term of the same meaning with that of *Cicatrizantia*.

ERODENTIA. Medicines which destroy the texture of our simple solid, and render a part of them therefore ready to be separated from the rest, in the manner to be hereafter more clearly explained.

ERRAINA. Medicines suited to promote the evacuation of mucus from the internal membrane of the nose. The term is to be more fully considered hereafter.

ESCHAROTICA. A term of the same meaning with that of *Ero-dentia*; or how far different, will be considered hereafter.

EVACUANTIA. Medicines suited to promote the natural excretions, or in any other way to draw fluids out of the body.

EXPECTORANTIA. Medicines suited to promote the excretion or rejection of mucus or pus from the lungs. What extent may be given to the meaning of this term, will be considered hereafter in its proper place.

F.

FEBRIFUGA. Medicines suited to prevent or cure fever. A term which, however properly it might have been formerly admitted, cannot now be employed but in a vague and undetermined meaning, and therefore most improperly.

G.

GALACTOPHORA. Medicines supposed to increase the produc-

tion of milk in the human body. and to determine it more copiously to the breasts of females. As we cannot perceive that any medicines are possessed of such a quality, we must judge the term to be without foundation, and therefore improperly employed.

H.

HEPATICA. Medicines supposed to be suited to cure the diseases of the liver; but as I do not know of any medicines which either can be particularly directed to that viscus, or which have any power of promoting the motion of the fluids in it, or which are possessed of any quality and specific power of promoting the secretion of bile, we judge the power of such medicines to be imaginary, and the term absolutely improper.

HUMECTANTIA. Medicines suited to moisten the solids of the body, and therefore of nearly the same meaning with Emollientia, as we shall explain more fully hereafter.

HYDRAGOGA. Medicines supposed electively to carry off water by stool. What foundation there is for supposing any purgatives possessed of such a power, we shall consider hereafter under the title of Cathartica.

HYDROTICA. A term of the same meaning with that of Sudorifica, or Sudorifera.

HYPNOTICA. Medicines capable of inducing sleep. Whether there are any medicines which have this power, but by a more general operation, and therefore to be marked by a more general term, we shall consider hereafter under the title of Sedatives.

I.

IMMUTANTIA. Of the same meaning with that of Alterantia.

INCIDENTIA. Medicines supposed to divide, or as it were to cut through the particles of our fluids, or to separate any number of these particles preternaturally cohering together. A power of medicine, which, as mechanical, I take to be quite imaginary, as we shall endeavour to prove hereafter, when we shall consider the power of medicines acting upon the fluids.

INCRASSANTIA. Medicines supposed to have a power of thickening the consistence of our fluids. How far there is a foundation for the use of such a term, or in what sense to be understood, we shall consider hereafter.

INDURANTIA. Medicines supposed to harden the solid parts. How far, or in what sense, such a power in medicines can be supposed, shall be said hereafter under the title of astringents.

L.

LACTIFUGA. Medicines supposed to have the power of dispelling milk collected in the breasts of females. It cannot be readily admitted that any medicines have a specific power in this respect; and if there be any that can produce the effect, it must be by a more general operation, and by the terms adapted to that the vis lactifuga should be expressed.

LAXANTIA. A term that may be employed in the same sense with that of Emollientia; but the term is now more commonly employed for those medicines, *Angl. Laxatives*, which in a gentle manner promote the evacuation by stool.

LENIENTIA. Medicines suited to abate irritation and its effects, and particularly by correcting the quality of the irritating matter.

LITHONTRIPTICA. Medicines supposed to dissolve stony concretions existing in the urinary passages. It is still, I think, a question whether any medicine given by the mouth, has such power: and although I would not with any confidence determine against the possibility of such a power, I must acknowledge that I am very doubtful if there be any such; and I am certain that in most instances it has been falsely supposed by writers on the *materia medica*.

M.

MATURANTIA. Medicines supposed to favour the production and complete formation of pus in inflammatory tumours. There are certainly means which may be employed for favouring these operations of nature; but as it cannot be admitted that any medicines are endowed with any specific power to this purpose, the term as applied to medicines seems to be quite improper.

MELANAGOGA. Medicines supposed to have a power of electively carrying off *atribilis* by stool. Though we should admit with the ancients and *Dr. Boerhaave*, the existence of such an humour, we would refuse to admit such an elective quality in any purgative, and therefore the propriety of any such term; but the objection to this becomes much stronger when we can deny the existence of any such humour in the body.

MENAGOGA and **EMMENAGOGA.** Medicines suited to promote the menstrual flux in women, or to excite and restore it when retained or suppressed. We cannot absolutely deny such a power in medicine, and therefore the use of the term; but I would have it cautiously admitted, as I am of opinion that in an hundred instances it has been employed without reason. More of this, however, hereafter in its proper place.

MUNDIFICANTIA. Medicines suited to clean ulcers from any impurities adhering to them. The meaning of the term is nearly the same with that of *detergentia* and *cathæretica*, and the most general term is always the least proper.

N.

NEPHRITICA. Medicines suited to cure the diseases of the kidneys. A term, as too general, absolutely improper.

NERVINA. Medicines suited to relieve the diseases or correct the disorders of the nervous system. The obscurity that still attends the mode of the operation of medicines upon the nervous system, might excuse this term; but it seems to be more general than necessary, and we shall never get the better of the obscurity mentioned till more precision is attempted upon the subject.

NUTRIENTIA. Substances suited to be converted into the fluids and solids of the body.

O.

OBTUNDENTIA. Medicines suited to cover and blunt the acrimony of the fluids. With respect to the propriety of the term, see the article *Demulcentia* in our after treatise.

OBVOLVENTIA. The same with *Obtudentia*.

ODONTALGICA. Medicines suited to relieve the tooth-ach.

This, and the three following terms, as too general, are absolutely improper.

ODONTICA. Medicines suited to relieve the diseases of the teeth.

OPHTHALMICA. Medicines adapted to the diseases of the eyes.

OTICA. Medicines suited to the diseases of the ears.

P.

PANCHYMAGOGA. Medicines suited to evacuate by stool humours of all kinds.

PAREGORICA. A term of the same meaning with that of Anodyna.

PECTORALIA. Medicines suited to the diseases of the breast.—Employed in that general sense it is absolutely improper, and has certainly led to abuse. As it is at present commonly employed in the same sense as the term of Expectorantia, it perhaps might be allowed; but certainly the latter term, as more precise, ought to be the one commonly made use of. If the Pectoralia may, with *Mr. Lieutaud*, be of three kinds, Demulcentia, Astringentia, and Resolventia, it will be very obvious that the general term may be liable to much abuse.

PHAGEDÆNICA. Of the same meaning with Erodentia.

PHLEGMAGOGA. Medicines supposed to have an elective power of evacuating pituitous matter by stool. See above the title Cholagoga.

PNEUMONICA and PULMONICA. Medicines adapted to the diseases of the lungs. Terms which, like other vague and general ones, should certainly be avoided.

PSILOTHRA. A term of the same meaning with Depilatoria.

PTARMICA. Of the same meaning with Errhina.

R.

REFRIGERANTIA. Medicines suited to diminish the heat of the body. The propriety and precise meaning of the term will be considered hereafter in the article of Sedantia.

REPELLENTIA, REPERCUTIENTIA, and REPRIMENTIA. Medicines suited to diminish the influx of the fluids into the parts to which the medicines are applied, or to drive backwards the fluids already in these parts. Terms, however, in whatever sense employed, too general, and therefore improper; but they will be considered more fully hereafter under the article of Astringents.

RESOLVENTIA. A term employed in the same sense as that of Discutientia, for medicines suited to remove those external tumours supposed to depend upon obstruction; but so far as employed either externally or internally, they are supposed to have their effects by destroying the cohesion of concremented fluids. The term appears to be employed upon a very uncertain foundation.

RESTAURANTIA. A term for medicines suited to restore lost strength; but commonly applied to those which restore that loss of strength depending upon the waste of fluids, and in that sense nearly the same with the term of Nutrientia; which we see above.

ROBORANTIA, *Strengtheners*. Medicines suited to strengthen the body, and therefore to restore the strength when it has been lost. As a general term it may be improper; but as it is commonly employed for

medicines which increase the tone of the moving fibres, it may be allowable.

RUBEFACIENTIA. Medicines which applied to the skin produce a redness, and excite some degree of inflammation on it. See the further consideration of this under the title of *Stimulantia* in the *materia medica*.

S.

SARCOTICA. Medicines suited to produce or to favour the growth of the flesh in wounds and ulcers. As the power of any medicine to this purpose is very doubtful, the propriety of the term must also be so.

SEDANTIA, *Sedatives*. Medicines suited to diminish the motions, and power of motion in the body. What medicines may be comprehended under this title, will be considered hereafter in its proper place.

SIALAGOGA. Medicines suited to excite and increase the secretion of saliva. A title to be considered more fully hereafter.

SISTENTIA. Medicines adapted to diminish or suppress increased evacuations. A term manifestly too general and improper.

SOMNIFERA and **SOPORIFERA.** Terms of the same meaning with that of *Hypnotica*.

SPLENETICA. Medicines supposed to relieve the diseases of the spleen. See our reflections upon the term *hepatica*, which are more certainly applicable here.

STERNUTATORIA. Medicines fitted to excite sneezing.

STIMULANTIA, *Stimulants*. Medicines fitted to excite the action of moving fibres, and in general the active powers of the system. A general term, admissible and necessary in our treatise on the *materia medica*, in which the various operation of such medicines is particularly explained.

STOMACHICA. Medicines suited to excite and strengthen the action of the stomach. I have been at a loss to determine how far this term, so frequently employed, could be properly rejected; but I am persuaded it ought to be so, for the same reason as other too general terms.

SUPPURANTIA. A term employed with respect to inflammatory tumours, in the same sense with that of *Maturantia*, and equally improper; but it is also employed with respect to wounds and ulcers, for medicines suited to produce pus in these: but as any specific power in medicines to this purpose can hardly be admitted, the term in this sense must be improper.

T.

TEMPERANTIA. A term of loose and uncertain meaning; sometimes used in the same sense as the term *Refrigerantia*, for medicines suited to diminish the heat, and thereby the activity, of the system; sometimes in the same sense as the term *demulcentia*, for medicines suited to correct or cover the matters which give irritation; and sometimes, according to *Mr. Lieutaud*, for medicines which carry noxious and irritating matters out of the body: but after thus observing that it may be employed with such different meanings, it cannot be doubted that this term is one of the most vague and improper

general terms. Whoever reads the work of *Mr. Lieutaud* will find, that the use of this term frequently occasions much ambiguity.

THERIACA. Medicines suited to resist or to obviate the effects of poisons from the bites of venomous animals. A term introduced by the ancients upon a very false supposition, and continued by the moderns upon no better grounds, in the same sense as the terms of *Alexipharmaca* and *Alexiteria*. But with the absurd compositions which have so long disgraced our pharmacopœias, and to which the term has been applied, the term itself should also be rejected.

THORACICA. Medicines adapted to the cure of the diseases of the thorax. A term as faulty and improper as the terms of *Pectoralia* and *Pulmonica*; upon which we have observed above.

TRAUMATICA. Of the same meaning with the term *Vulneraria*; which see below.

TYLLOTICA. Of the same meaning with the term *Catagmatica*; which see above.

U.

UTERINA. Medicines suited to cure the diseases of the uterus. A term too general to be admitted.

VULNERARIA. Medicines suited to favour and promote the cure of wounds. As the cure of wounds must be very entirely an operation of nature, the surgeon has hardly any other employment in this business than to avoid or remove the circumstances which might impede the operation of nature. When such circumstances occur with respect to recent wounds, it is very doubtful if any internal medicines can be of use to obviate or remove them; and at least it is not probable that the medicines given under the title of *Vulneraries* can have any effect to this purpose. It is therefore that the surgeons of Britain omit entirely the employment of such medicines; and it is surprising that foreign surgeons do still employ them, and the absurd compositions of them, which have been proposed. It is also surprising, that even late writers on the *materia medica* should so frequently continue the use of an indefinite and commonly ill founded term. It is indeed possible that the *Peruvian bark*, and other analogous substances, may in some cases be of use in mending the weakness of the system, and therefore the flaccidity of the parts affected; and perhaps in other cases some internal medicines may be of use; but they should be mentioned as answering a particular indication, and by no means under the indefinite term of *Vulneraries*.

Having now explained my terms, I think it proper to present a general view of the whole subject of my Treatise in the following Table; and to supersede repetitions which might otherwise be afterwards necessary, it may be proper to give a methodical Catalogue of the particular aliments and medicines of which we are afterwards to treat. In both these parts of my work, it is for obvious reasons necessary to employ the appellations of the Latin language.

MATERIÆ MEDICÆ

TABULA GENERALIS,

In qua Medicamenta ad Capita quædam secundum indicationes morborum curatorias quibus respondent, referuntur.

MATERIA MEDICA constat ex

{	NUTRIMENTS, quæ sunt,		P. I.
	<i>Cibi</i> , Sect. I. <i>Potus</i> , S. II. et quæ cum his assumuntur <i>Condimenta</i> , S. III.		
{	MEDICAMENTIS, quæ agunt in		P. II.
	Solida.		
{	Simplicia.		
	<i>Astringentia</i> , Cap. I. <i>Tonica</i> , C. II. <i>Emollientia</i> , C. III. <i>Erodentia</i> , C. IV.		
{	Viva.		
	<i>Stimulantia</i> , C. V. <i>Sedantia</i> , <i>Narcotica</i> , C. VI. <i>Refrigerantia</i> , C. VII. <i>Antispasmodica</i> , C. VIII.		
{	Fluida.		
	Immutantia.		
{	Fluiditatem.		
	<i>Attenuantia</i> , C. IX. <i>Inspissantia</i> , C. X.		
{	Misturam.		
	<i>Acrimoniam corrigentia</i> . In genere <i>Demulcentia</i> , C. XI. In specie <i>Antacida</i> , C. XII. <i>Antalkalina</i> , C. XIII. <i>Antiseptica</i> , C. XIV.		
{	Evacuantia.		
	<i>Errhina</i> , C. XV. <i>Sialagoga</i> , C. XVI. <i>Expectorantia</i> , C. XVII. <i>Emetica</i> , C. XVIII. <i>Cathartica</i> , C. XIX. <i>Diuretica</i> , C. XX. <i>Diaphoretica</i> , C. XXI. <i>Menagoga</i> , C. XXII.		

CATALOGUS

RERUM SPECIALIUM EX QUIBUS CONSTAT

MATERIA MEDICA.

Secundum ordinem Tabulæ præcedentis et quibus singulis apponuntur: 1mo, *Nomen Pharmaceuticum*, sive quo in Pharmacopæis publicis et in Pharmacopolarum officinis plerumque insignitur. 2do, *Nomen Botanicum*, sive plantarum genericum et specificum triviale in Systemate Linneano nunc autem ad paginas Systematis Vegetabilis Linneani ab illustr. *Andrea Murray*, ann. 1784, editi relatum, ubi nomen specificum cum differentia specifica inveniri potest. 3tio, *Nomen Anglicanum*.

PARS I. NUTRIMENTA.

SECTIO I. CIBI.

I. EX VEGETABILIBUS.

Fructus.

A. FRUCTUS.

a. *Acido-dulces recentes.**Drufaceæ.*

Cerasus,

Prunus Cerasus, Syst. Vegetab. apud Murray. pag. 463,

Cherry.

Prunus,

Prunus domestica M. 463,

Plum.

Malum Armeniacum,

Prunus Armeniaca M. 463,

Apricot.

Malum Persicum,

Amygdalus Persica M. 462,

Peach and Nectarine.

Pomaceæ.

Malum hortense,

Pyrus Malus M. 466,

Apple.

Pyrus hortensis

Pyrus communis M. 466,

Pear.

Aurantium,

Citrus Aurantium, M. 697,

Seville orange,

China orange.

Limonium,

Citrus Medica M. 697,

Lemon.

Senticosæ.

Fraga.

Fragaria vesca M. 476,

Strawberry.

Rubus idæus,

Rubus idæus M. 475,

Raspberry.

Ribesia.

Ribes rubrum,

Ribes rubrum M. 242,

Red currant.

Ribus nigrum,

Ribes nigrum M. 243,

Black currant.

Grossularia,

Ribes Grossularia M. 243,

Gooseberry.

Uvæ vitis,

Vitus vinifera M. 244

Grapes.

b. *Acido-dulces siccatæ.*

Uvæ passæ majores,

Vitus vinifera M. 244,

Raisins.

Uvæ passæ minores,

Vitus vinifera apyrena Linn.

spec. plant. var. β. p. 293.

Dried currants.

Caricæ,

Ficus caraca M. 921,

Fig.

Dactyli,

Phœnix dactylifera M. 983,

Date.

*Fructus.**c. Cucurbitaceæ.*

Cucumis,
Cucumis sativus M. 869,
Cucumber.

Melo,
Cuminis melo M. 869,
Melon.

B. HERBÆ OLERACEÆ

Atriplex,
Atriplex hortensis M. 909.
Orache.

Beta,
Beta vulgaris M. 262,
Beet.

Spinacia,
Spinacia oleracea M. 886,
Spinage.

Valerianella,
Valeriana locusta M. 80,
Lamb lettuce.

Siliquosæ.

Brassica,
Brassica oleracea M. 601,
Colewort and cabbage.
Nasturtium hortense,
Lepidium sativum M. 586,
Garden cress.
Nasturtium aquaticum,
Sisymbrium Nasturtium M.
594,

Water cress.

Semiflosculosæ.

Cichorium,
Cichorium Intybus M. 722,
Succory.
Endivia,
Cichorium Endivia M. 722,
Endive.

Dens leonis,
Leontodon Taraxacum M. 715
Dandelion.

Lactuca,
Lactuca sativa M. 713,
Lettuce.

Umbellatæ.

Celeri,
Apium graveolens M. 292,
Celery.

Herbæ Oleraceæ.

Petroselinum,
Apium Petroselinum M. 292,
Parsley.

Capitatæ.

Cinara,
Cynara Scolymus M. 728,
Artichoke.

Asparagus,
Asparagus officinalis M. 332
Asparagus.

C. RADICES.*Siliquosæ.*

Raphanus,
Raphanus sativus M. 603,
Radish.

Rapum,
Brassica Rapa M. 601,
Turnip.

Umbellatæ.

Daucus,
Daucus Carota M. 277,
Carrot.

Pastinaca,
Pastinaca sativa M. 290,
Parsnip.

Sisarum,
Sium Sisarum M. 284,
Skirret.

Semiflosculosæ.

Scorzonera,
Scorzonera Hispanica, M.
711,

Viper's grass.

Tragopogon,
Tragopogon porifolium M.
710.

Salsafi.

Alliaceæ.

Allium,
Allium sativum M. 322,
Garlic.

Porrum,
Allium porrum M. 321,
Leek.

Cepa,
Allium Cepa M. 323,
Onion.

Cepa ascalonica

Radices.

Allium ascalonicum M. 323,
Shallot.
Scorodophrasum,
Allium Scorodophrasum M.
322,
Roccambale.

Farinosæ.

Battatas,
Solanum tuberosum M. 224,
Potatoes.
Salep,
Orchis Morio M. 808,
Salep.

D. SEMINA.

Cerealia.

Hordeum,
Hordeum vulgare M. 125,
Barley.
Avena,
Avena sativa M. 122,
Oat.
Secale,
Secale cereale M. 125,
Rye.
Millium,
Panicum miliaceum M. 106,
Millet.
Triticum,
Triticum hybernum M. 126,
Wheat.
Oryza,
Oryza sativa M. 345,
Rice.
Maiz,
Zea Mays M. 841,
Maize.

Cerealibus affinia.

Sago,
Cycas circinalis M. 925,
Sago.
Fagopyrum,
Polygonum Fagopyrum M.
379,
Buck wheat.
Castanea,
Fagus Castanea M. 859,
Chesnut..

Semina.

Legumina,
Pisum,
Pisum sativum M. 660,
Pea.
Faba,
Vicia Faba M. 665,
Bean.
Phaseolus,
Phaseolus vulgaris M. 656,
Kidney bean.

Nuces oleosæ.

Amygdalus,
Amygdalus communis M. 462,
Variat dulcis,
amara,
Sweet almonds,
Bitter almonds.
Avellana,
Corylus Avellana M. 859,
Filbert.
Cacao,
Theobroma Cacao M. 696,
Chocolate.
Juglans,
Juglans regia M. 858,
Walnut.
Pistachio,
Pistacia vera M. 884,
Pistachio nut.

Sesuiariæ.

Olivæ,
Olea Europæa M. 57,
Olives.

E. FUNGI.

Agarius campestris M. 975,
Common esculent mushroom.
Phallus esculentus M. 978,
Morell.
Lycoperdon tuber M. 981,
Truffle.

SECTIO II. POTUS.

Aqua et aquosa.
Potus fermentati.
Cerevisia.
Vinum.

SECTIO III. CONDIMENTA ET
CONDITA.

Aromata et acria.

Quadrupedia.

Saccharo, sale, vel aceto Condita.

II. EX ANIMALIBUS.*

A. QUADRUPEDIA.

a. *Lac.*

Fœminæ,
Asinæ,
Equæ,
Vaccæ,
Capræ,
Ovis.

b. *Carnes.**Pecora.*

Bos,
Bos Taurus Linn. Syst. Nat.
98,
The ox,
Ovis,
Ovis Aries L. 97,
The sheep.
Caper,
Capra Hircus L. 94,
The goat.
Cervus,
Cervus Elaphus L. 93,
The hart, stag, or red deer.
Cervus,
Cervus Dama L. 93,
Buck or fallow deer.
Cervus,
Cervus Capreolus L. 94,
Roebuck.

Glîres.

Lepus,
Lepus timidus L. 77,
The hare.
Cuniculus,
Lepus Cuniculus L. 77,
The rabbit.

Belluæ.

Sus,
Sus Scrofa L. 102.
The Hog.

B. AVES.

Gallinæ.

Gallus,
Phasianus Gallus L. 270,

Avcs.

Dunghill fowl.

Phasianus,
Phasianus colchicus L. 270,
Pheasant.

Gallo Pavo,
Meleagris Gallo pavo L. 268,
Turkey.

Pavo,
Pavo cristatus L. 267,
Peacock.

Meleagris,
Numida Meleagris L. 273,
Guinea hen.

Perdix,
Tetrao Perdix L. 276,
Partridge.

Coturnix,
Tetrao Coturnix L. 278,
Quail.

Lagopus,
Tetrao Lagopus L. 274,
Ptarmigan.

Tetrao rufescens,
Bonasa Scotica Brisson. Or-
nith. p. 199,
Scotis, Moorfowl,
Anglis, Redgame or Grouse.

Tetrix,
Tetrao Tetrix L. 274.
Black cock, or black game.

Urogallus,
Tetrao Urogallus L. 273,
Cock of the mountain.

Anseres.

Anas domestica,
Anas Boschas L. 205,
Common duck.

Querquedula,
Anas Crecca L. 204,
Teal.

Anser domesticus et ferus,
Anas Anser L. 197,
Tame and wild goose.

Anser Bassanus,
Pelicanus Bassanus L. 217,
Solon goose.

* Animalium nomina systematica ad Linnæi Systema Naturæ anno 1766 editum
ubique referuntur

Aves.

Alca,
Alca Tordo L. 210,
Razorbill or marrot.
Larus,
Larus tridactylis L. 224,
Kittiwake.

Grallæ.

Scolopax,
Scolopax rusticola L. 243,
Woodcock.
Gallinago minor,
Scolopax Gallinago L. 244,
Snipe.
Arquata,
Scolopax Arquata L. 242,
Curlew.
Tringa,
Tringa Squatarola L. 252,
Grey plover.
Charadrius,
Charadrius pluvialis L. 254,
Green plover.
Rallus,
Rallus Crex L. 261,
Land rail.

Passeres.

Columba,
Columba Oenas L. 279,
Pigeon.
Alauda,
Alauda arvensis L. 287,
Lark.

VOLUCRUM OVA.

C. AMPHIBIA.

Amphibia reptilia.

Testudo,
Testudo Mydas L. 350,
Tortoise.
Rana,
Rana esculenta L. 357,
Frog.

Amphibia serpentia.

Vipera,
Coluber berus L. 377,
Viper or adder.

Amphibia nantia.

Batis,

Amphibia.

Raia Batis L. 395,
Skate.
Clavata,
Raia clavata L. 397,
The thornback.

D. PISCES.

Anguilla,
Muræna Anguilla L. 426,
Eel.
Anarhichas,
Anarhichas Lupus L. 430,
Wolf-fish, or cat-fish.
Gadus,
Gadus Morhua L. 436,
Cod.
Gadus Eglefinus L. 435,
Haddock.
Gadus Merlangus L. 438,
Whiting.
Faber,
Zeus Faber L. 454,
The doree.
Pleuronectes,
Pleuronectes Rhombus L.
458,
Turbot.
Pleuronectes Solea L. 457,
The sole.
Pleuronectes Flesus L. 457,
Grey flounder.
Perca,
Perca fluviatilis L. 481,
Perch.
Scomber,
Scomber Scomber L. 492,
Mackrel.
Salmo,
Salmo Salar L. 509,
Salmon.
Esox Lucius L. 516,
The pike.
Glupea Harengus L. 522,
Herring.
Clupea Encrasicolus L. 523,
Anchovy.
Cyprinus Carpio L. 525,
Carp.

Pisces.

Cyprinus Trinca L. 526,
Tench.

E. INSECTA.

Cancer,
Cancer Pagurus L. 1044,
Common crab.
Cancer Gamarus L. 1050,
The lobster.
Cancer Astacus L. 1051,
The crayfish.
Cancer Squilla L. 1051,

Vermes.

The prawn.

F. VERMES.

Pectunculus vulgaris,
Cardium edule L. 1124,
Cockle.
Ostrea,
Ostrea edulis L. 1148,
Common oyster.
Mytilus,
Mytilus edulis L. 1157,
Common muscle.

PARS II. MEDICAMENTA.

I. ADSTRINGENTIA.

A. EX FOSSILIBUS.

Bolus,
Argilla,
Bole.
Creta,
Calx Creta,
Chalk.
Alumen,
Alumen commune schisti,
Alum.

Metallica.

Ex Ferro :

Hæmatites,
Rubigo,
Vitriolum viride.

Ex Cupro :

Ærugo,
Vitriolum cæruleum.

Ex Plumbo :

Cerussa,
Saccharum saturni,
Lithargyrus,
Minium.

Ex Zinco :

Calaminaris,
Tutia,
Vitriolum album.

B. EX VEGETABILIBUS.

a. *Senticosæ.*

Agrimonia,
Agrimonia Eupatoria M. 417,
Agrimony,

Ex Vegetabilibus.

Alchemilla,
Alchemilla vulgaris M. 166,
Ladies mantle.

Argentina,
Potentilla Anserina M. 477,
Silver weed.

Caryophyllata,
Geum urbanum M. 480,
Avens.

Fragaria,
Fragaria vesca M. 476,
Strawberry.

Rosa Rubra,
Rosa Gallica M. 474,
The red rose.

Quinquefolium,
Pentaphyllum,
Potentilla reptans M. 479,
Cinquefoil.

Tormentilla,
Tormentilla erecta M. 479,
Tormentil.

b. *Stellatæ.*

Aparine,
Galium Aparine M. 151,
Goose grass.

Galium,
Galium verum M. 150,
Ladies bedstraw.

Rubia,
Rubia tinctorum M. 152,
Madder.

*Ex Vegetabilibus.*c. *Vaginales.*

Acetosa,
Rumex Acetosa M. 348,
Sorrel.
Hydrolapathum,
Rumex aquaticus M. 347,
Great water-dock.
Oxlapathum,
Rumex acutus M. 346,
Sharp pointed dock.
Bistorta,
Polygonum Bistorta M. 376,
Greater bistort.
Rhabarbarum monachorum,
Rumex alpinus M. 347,
Monks rhubarb.
Rhaponticum,
Rheum Rhaponticum M. 385,
Rhapontic.

d. *Cryptogamie.*

Filix florida,
Osmunda regalis M. 927,
Flowering fern.
Lingua cervina,
Asplenium Scolopendrium M.
932,
Harts-tongue.
Trichomanes,
Asplenium Trichomanes M.
941,
Maidenhair.
Filix,
Polypodium Filix mas M. 937,
Male fern.
Equisetum,
Equisetum hyemale M. 925,
Horse tail.
Muscus pyxidatus,
Lichen pyxidatus M. 963,
Cup-moss.

e. *Cortices.*

Malicorium,
Punica Granatum M. 462,
Pomegranate kind.
Fraxini,
Fraxinus excelsior M. 918,
Ash bark.
Querci,

Ex Vegetabilibus.

Quercus Robur M. 858,
Oak bark.
Lignum Campechense,
Hæmatoxylum Campechia-
num M. 398,
Logwood.
Gallæ,
Quercus Cerris M. 858,
Galls.

f. *Fructus acerbi.*

Cydonia,
Pyrus Cydonia M. 467,
Quinces.
Mespila,
Mespilus Germanica M. 466,
Medlers.
Mora,
Morus nigra M. 851,
Mulberries.
Pruna Silvestria,
Prunus spinosa M. 463,
Sloes.
Sorba,
Sorbus domestica M. 465,
Wild service berries.

g. *Succi inspissati.*

Acacia,
Mimosa Nilotica M. 917,
Acacia.
Terra Japonica,
Mimosa Catechu M. 916,
Japan earth.
Sanguis Draconis,
Pterocarpus Draco M. 641,
Dragon's blood.
Kino,
Gummi rubrum astringens,
Kino.

h. *Adstringentia varia ad certa capita non referenda.*

Anchusa,
Anchusa tinctoria M. 186,
Alkanet.
Balaustia,
Punica Granatum M. 462,
Balaustines.
Hypericum,
Hypericum perforatum M. 701

Ex Vegetabilibus.

St John's wort.
 Salicaria,
 Lythrum Salicaria M. 446,
 Loose strife.
 Millefolium.
 Achillea Millefolium M. 778,
 Milfoil or yarrow.
 Myrtus,
 Myrtus communis M. 461,
 Myrtle.
 Plantago,
 Plantago major M. 155,
 Plantain.
 Polygonatum,
 Convallaria Polygonatum M.
 334,
 Solomon's seal.
 Viscus quernus,
 Viscum album M. 883,
 Mistletoe.
 Uva Ursi,
 Arbutus Uva Ursi M. 408,
 Bear's berry.

II. TONICA.

Gentiana,
 Gentiana lutea M. 267,
 Gentian.
 Cursuta,
 Gentiana purpurea M. 267,
 Cursuta.
 Centaureum minus,
 Gentiana Centaureum M.
 268,
 Lesser centaury.
 Quassia,
 Quassia amara M. 401,
 Quassy.
 Simarouba,
 Quassia Simarouba M. 401,
 Simarouba.
 Trifolium palustre,
 Menyanthes trifoliata M.
 194,
 Marsh trefoil or buck bean.
 Faba St. Ignatii,
 Ignatia amara M. 227,
 Jesuit's bean.

Tonica.

Fumaria,
 Fumaria officinalis M. 637,
 Common fumitory.
 Chamamælum,
 Anthemis nobilis M. 776,
 Chamomile.
 Tanacetum,
 Tanacetum vulgare M. 742,
 Tansey.
 Absynthium,
 Artemisia Absynthium M. 744
 Wormwood.
 Abrotanum,
 Artemisia Abrotanum M.
 743,
 Southernwood.
 Lupulus,
 Humulus Lupulus M. 886,
 Hops.
 Scordium,
 Teucrium Scordium M. 527,
 Water germander.
 Serpentaria Virginiana,
 Aristolochia Serpentaria M.
 824,
 Virginian snake-root.

Arnica,
 Arnica montana M. 768,
 Leopard's bane.
 Cortex Peruvianus,
 Cinchona officinalis M. 213,
 Peruvian bark.

III. EMOLLIENTIA.

Aqua,
 Aqua cum farinosis vel mucilaginosis infusa vel decocta.

1. Ex VEGETABILIBUS.

a. *Columniferae.*

Althæa,
 Althæa officinalis M. 624,
 Marsh mallow.

Malva,
 Malva Silvestris M. 625,
 Mallow.

b. *Farinosa vel mucilaginoso.*

Cannabis semina,
 Cannabis sativa M. 886,
 Hemp-seed.

Ex Vegetabilibus.

Cydoniorum semina,
Pyrus Cydonia, M. 467,
Quince-seed.

Fænugræci semina,
Trigonella Monspeliensis M.
692,

Fenugreek seed.

Lini semina,
Linum usitatissimum M. 302,
Linseed.

Psyllii semina,
Plantago Psyllium M. 156,
Fleawort seed.

c. Oleraceæ.

Atriplex.
Atriplex hortensis M. 909,
Orache.

Beta,
Beta vulgaris M. 262,
White and red beet.

Bonus Henricus.
Chenopodium Bonus Henri-
cus M. 261,
English mercury.

Spinacia,
Spinacia oleracea M. 886,
Spinage.

d. Emollientia varia.

Alsine,
Alsine media M. 298,
Chickweed.
Branca ursina,
Acanthus mollis M. 580,
Bears breech.

Melilotus,
Trifolium Melilotus M. 687,
Melilot.

Parietaria,
Parietaria officinalis M. 908,
Pellitory of the wall.

Saponaria,
Saponaria officinalis M. 416,
Soapwort.

Verbascum,
Verbascum Thapsus M. 219,
Mullein.

Radix liliorum alborum,
Lilium candidum M. 324,

Ex Vegetabilibus.

White lily.

Cepæ coctæ,
Allium Cepa M. 323,
Onion.

e. Oleosa.

Olea expressa blanda.

2. EX ANIMALIBUS.

Lac,
Butyrum,
Adeps,
Axungia.
Spermaceti,
Physeter macrocephalus L.
107,
Spermaceti.

*IV. ERODENTIA SIVE CORRO-
SIVA.*

Acidum concentratum,
Vitriolicum,
Nitrosum.

Costicum commune acerri-
mum,

Lixivium causticum inspissa-
tum Ph. Ed.

Strong caustic.

Causticum commune mitius,
Lixivium Causticum cum cal-
ceviva Ph. Ed.

Common caustic.

Causticum commune fortius,
Calx cum Kali puro Ph.
Lond.

Strong London caustic.

Causticum Lunare,
Acidum nitrosum argento
junctum,

Lunar caustic.

Vitriolum cæruleum,
Acidum vitriolicum cupro
junctum,

Blue vitriol.

Ærugo,

Acidum vegetabile cupro
junctum,

Verdigrise.

Butyrum antimonii,

Acidum nuriaticum antimonio
junctum,

Erodentia sive Corrosiva.

Butter of antimony.
 Hydrargyrus acidis variis
 junctus,
 Preparations of quicksilver.
 Arsenicum album,
 Arsenicum nudum L. S. N.
 107,
 Arsenic.

V. STIMULANTIA.

A. VERTICILLATÆ.

Betonica,
 Betonica officinalis M. 535,
 Betony.
 Lavendula,
 Lavendula Spica M. 530,
 Lavender.
 Melissa,
 Melissa officinalis M. 542,
 Baum.
 Majorana,
 Origanum Majorana M. 541,
 Sweet marjoram.
 Origanum,
 Origanum vulgare M. 541,
 Wild marjoram.
 Marum,
 Origanum Syriacum M. 541,
 Syrian herb mastich.
 Rosmarinus,
 Rosmarinus officinalis M. 68,
 Rosemary.
 Hyssopus,
 Hyssopus officinalis M. 529.
 Hyssop.
 Hedera terrestris,
 Glechoma hederacea M. 534,
 Ground ivy.
 Mentha,
 Mentha viridis M. 532,
 Mentha spicata Hudsoni Flo-
 ra Anglica,
 Spearmint.
 Mentha piperita
 Mentha piperita M. 532,
 Peppermint.
 Pulegium,
 Mentha Pulegium M. 533,
 Pennyroyal.

Verticillata.

Satureia,
 Satureia hortensis M. 528,
 Savoury.
 Thymus,
 Thymus vulgaris M. 542,
 Thyme.
 Serpyllum,
 Thymus Serpyllum M. 541,
 Mother of thyme.
 Salvia,
 Salvia officinalis M. 68,
 Sage.

B. UMBELLATÆ.

Anethum,
 Anethum graveolens M. 290,
 Dill.
 Angelica,
 Angelica Archangelica M.
 284,
 Garden angelica.
 Anisum,
 Pimpinella Anisum M. 291,
 Anise.
 Carum,
 Carum Carvi M. 291,
 Caraway.
 Coriandrum,
 Coriandrum sativum M. 287,
 Coriander.
 Cuminum,
 Cuminum Cyminum M. 285,
 Cumin.
 Fœniculum,
 Anethum Fœniculem M. 291,
 Sweet Fennel.
 Pimpinella,
 Pimpinella Saxifraga M. 291,
 Burnet saxifrage.

C. SILIQUOSÆ.

Cochlearia,
 Cochlearia officinalis M. 588,
 Scurvy-grass.
 Erysimum,
 Erysimum officinale M. 596,
 Hedge mustard.
 Nasturtium,
 Sisymbrium Nasturtium M.
 594,

Siliquosæ.

Water cresses.
 Raphanus rusticus,
 Cochlearia Armoracia M. 583,
 Horse radish.
 Sinapi,
 Sinapis nigra M. 602,
 Mustard.

D. ALLIACEÆ.

Allium,
 Allium sativum M. 322,
 Garlic.
 Cepa,
 Allium Cepa M. 323,
 Onion.
 Porrum,
 Allium Porrum M. 321,
 Leek.

E. CONIFERÆ.

Abies,
 Pinus Abies M. 861,
 Scotch fir.
 Pinus,
 Pinus Silvestris M. 860,
 Pine.
 Juniperus,
 Juniperus communis M. 894,
 Juniper.

F. BALSAMICA.

Terebinthina Veneta,
 Pinus Larix M. 860,
 Venice turpentine.
 Terebinthina communis,
 Pinus Silvestris M. 860,
 Common turpentine.
 Balsamum Canadense,
 Pinus Balsamica M. 860,
 Canada Balsam.
 Balsamum Copaibæ,
 Copaifera officinalis M. 409,
 Balsam of Copaiba or Capivi.
 Balsamum Peruvianum,
 Myroxylon Peruiferum M.
 395,
 Peruvian balsam or balsam of
 Peru.
 Balsamum Tolutanum,
 Toluifera balsamum M. 398,
 Balsam of Tolu.

G. RESINOSA.

Guaiacum,
 Guaiacum officinale M. 396,
 Gum guaiacum.
 Myrrha,
 Myrrha,
 Myrrh.
 Ladanum,
 Cistus Creticus M. 497,
 Labdanum.
 Styrax calamita,
 Styrax officinale M. 409,
 Storax.
 Styrax liquida,
 Liquidambar Styraciflua M.
 860,
 Liquid storax.
 Benzoinum,
 Croton Benzoe M. 863,
 Benjamin.

H. AROMATICA.

Cinnamomum,
 Laurus Cinnamomum M. 383,
 Cinnamon.
 Cassia lignea,
 Laurus Cassia M. 383,
 Cassia bark.
 Nux Moschata,
 Myristica Moschata M. 493,
 Nutmeg.
 Macis,
 Myristica Moschata M. 493,
 Mace.
 Caryophyllus,
 Caryophyllus aromaticus M.
 496,
 Cloves.
 Pimento,
 Myrtus Pimenta M. 462,
 Jamaica pepper or All-spice.
 Canella alba,
 Canella alba M. 443,
 Wild cinnamon.
 Cortex Winteranus,
 Wintera aromatica M. 507,
 Winter's bark.
 Cascarilla,
 Croton Cascarilla M. 863,
 Cascarilla.

Aromatica.

Piper,
 Piper nigrum M. 74,
 Black pepper.
 Capsicum,
 Capsicum annuum M. 226,
 Guinea pepper.
 Zingiber,
 Amomum Zingiber M. 50,
 Ginger.
 Cubebæ,
 Piper Cubeba sive Caudatum
 M. 74,
 Cubebs.
 Cardamomum minus,
 Amomum Cardamomum M.
 50,
 Cardamom.
 Zedoaria,
 Kaempferia rotunda M. 51,
 Zedoary.
 Serpentaria Virginiana,
 Aristolochia Serpentaria M.
 824.
 Virginian snake-root.
 Ginseng,
 Panax quinque folium M. 920,
 Ginseng.
 Acorus verus,
 Acorus Calamus M. 339,
 Sweet-scented flag.

I. ACRIA.

Arum,
 Arum maculatum M. 828,
 Cuckow pint.
 Persicaria urens,
 Polygonum Hydropiper M.
 377,
 Water-peper or arsmart.
 Pyrethrum,
 Anthemis Pyrethrum M. 576,
 Pellitoria of Spain.
 Staphisagria,
 Delphinium Staphisagria M.
 503,
 Staves acre.

SEDANTIA.

VI. NARCOTICA.

a. *Rhæades.*

Papaver,

Narcotica.

Papaver somniferum M. 490,
 White poppy.

b. *Umbellatæ.*

Cicuta,
 Conium maculatum M. 278,
 Hemlock.
 Cicuta aquatica,
 Cicuta virosa M. 286,
 Water hemlock.

c. *Solanacæ.*

Belladonna,
 Atropa Belladonna M. 221,
 Deadly night-shade.
 Hyoscyamus,
 Hyoscyamus niger M. 220,
 Henbane.
 Nicotiana,
 Nicotiana Tabacum M. 221,
 Tobacco.

Solanum,
 Solanum nigrum M. 224,
 Night-shade.
 Stramonium,
 Datura Stramonium M. 220,
 Thorn apple.

d. *Varia.*

Lactuca virosa,
 Lactuca virosa M. 713,
 Strong-scented lettuce.
 Lauro Cerasus,
 Prunus Lauro-Cerasus, M.
 462,
 Cherry bay.

Laurus,
 Laurus nobilis M. 383,
 Bay.

Camphora,
 Laurus Camphora M. 383,
 Camphire.

Thea,
 Thea Bohea M. 495,
 Thea viridis M. 496,
 Bohea and green tea.

Crocus,
 Crocus sativus M. 83,
 Saffron.

Nymphæa,
 Nymphæa alba M. 491,

Narcotica.

Nymphæa lutea M. 491,
Water lily.

e. Vinum.

Alcohol.

VII. REFRIGERANTIA.

Acida quæcunque diluta,
Sales neutri ex acido quovis
præter muriatico cum alkali
quovis juncto,
Sal terrestris ex acido cum
plumbo juncto,
Aquæ minerales salinæ,
Borax,
Alumen,
Plantarum fructus herbæ et
radices acidi,
Lactis serum,
Lac ebutyratum.

VIII. ANTISPASMODICA.

1. Ex FOSSILIBUS.

Ambra,
Ambra Ambrosiaca L. S. N.
207,
Ambergrease.
Succinum,
Succinum electricum L. 108,
Amber.
Petroleum,
Bitumen Petroleum L. 109,
Rock oil.

2. Ex VEGETABILIBUS.

Herbæ fœtidæ.

Artemisia,
Artemisia Vulgaris M. 744,
Mugwort.
Atriplex fœtida,
Chenopodium Vulvaria M.
262,
Stinking orache.
Cuminum.
Matricaria,
Matricaria Parthenium M.
744,
Feverfew.
Pulegium.

Ruta,

Antispasmodica.

Ruta graveolens M. 397,
Rue.
Sabina,
Juniperus Sabina M. 894,
Savin.

Gummi fœtidæ.

Asafœtida,
Ferula Asafœtida M. 281,
Asafœtida.

Ammoniacum,

Gum ammoniac.

Galbanum,
Bubon Galbanum M. 285,
Galbanum.
Opopanax,
Pastinaca Opopanax M. 290,
Opopanax.

Sagapenum,

Sagapenum.

Tacamahaca,
Populus balsamifera L. M.
600,
Tacamahaca.
Camphora.

Radices Graveolentes.

Pœonia,
Pœonia officinalis M. 502,
Pœony.
Valeriana sylvestris,
Valeriana officinalis M. 80,
Wild valerian.

Fuligo ligni.
Olea essentialia.
Æthera.
Olea empyreumatica.
Alcohol.

3. Ex ANIMALIBUS.

Moschus,
Moschus moschiferus L. 91,
Musk.
Castoreum,
Castor Fiber L. 78,
Castor.

Sales alkalini volatiles,

Antispasmodica.

Ammonia Ph. Lond.
Volatile alkali.

IX. DILUENTIA.

Aqua,
Aquosa blanda.

X. ATTENUANTIA.

Aqua,
Alkalina,
Sales neutri,
Sapones.
Dulcia,
Saccharum,
Mel,
Glycyrrhiza,
Fructus siccata.

XI. INSPISSANTIA.

Acida,
Alcohol,
Demulcentia farinosa et mucilaginosa.

XII. DEMULCENTIA..

a. *Asperifolia.*

Consolida major,
Symphytum officinale M. 187,
Cumfrey.
Cynoglossum,
Cynoglossum officinale M.
186,
Hound's tongue.

b. *Mucilaginosa.*

Gummi Arabicum,
Mimosa nilotica M. 917,
Gum Arabic.
Gummi cerasi,
Prunus Cerasus M. 463,
Cherry-tree gum.
Gummi Tragacantha
Astragalus Tragacantha M.
685,
Gum Tragacanth.
Amylum,
Ex tritico vel aliis farinosis,
Starch.
Ichthyocolla,
Acipenser Sturio L. 403,
Isinglass.

c. Gelatinæ ex rebus animalibus.

d. Oleosa blanda.

XIII. ANTACIDA.

Lapides calcariæ,
Creta,
Magnesia alba,
Testacea,
Corallium,
Corallina,
Cornu cervi ustum,
Sales alkalini fixi,
Sales alkalini volatiles,
Calx viva.

XIV. ANTALKALINA.

Acida quæcunque supra inter refrigerantia enumerata.

XV. ANTISEPTICA.

Sales acidi omnes supra inter refrigerantia recensiti,
Sales alkalini tum fixi tum volatiles,
Sales neutri ex acido quovis cum Sale alkalino vel cum terreis juncto,
Plantarum partes acidæ,
Olera acescentia,
Saccharum,
Mel,
Plantæ Siliquosæ vulgo antiscorbutica dictæ,
Plantæ alliaceæ,
Astringentia,
Amara,
Aromatica,
Olea essentialia,
Camphora,
Gummi Resinæ,
Crocus,
Radix Contrayervæ,
Radix valerianæ sylvestris,
Opium,
Decoctum capiti papaveris albi,
Vinum et liquores fermentati,
Alcohol.

XVI. ERRHINA.

Mitiora.

Beta,
Betonica,
Majorana.

Acriora.

Asarum,
Asarum Europæum M, 441

Errhina.

Asarabacca.
 Euphorbium,
 Euphorbium officinale M.
 449,
 Euphorbium.
 Helleborus albus,
 Veratrum album M. 902,
 White hellebore.
 Iris nostras.
 Nicotiana.
 Ptarmica,
 Achillea Ptarmica M. 777,
 Sneezewort.
 Pyrethrum,
 Turbith minerale.
 Hydrargyrus acido vitriolico
 junctus.

XVII. SALOGOGA.

Externa masticatoria.

Angelica.
 Caryophylli.
 Imperatoria,
 Imperatoria Ostruthium M.
 289,
 Masterwort.
 Nicotiana.
 Piper.
 Pyrethrum.

Interna.

Hydrargyrus.

XVIII. EXPECTORANTIA.

Hedera terrestris.
 Hyssopos.
 Marrubium,
 Marrubium vulgare M. 537,
 White horehound.
 Pulegium.
 Enula campana,
 Inula Helenium M. 766,
 Elecampane.
 Iris Florentina,
 Iris Florentina M. 88,
 Florentine Orrice.
 Nicotiana.
 Scilla,
 Scilla maritima M. 328,
 Squill.

Expectorantia.

Tussilago,
 Tussilago Farfara M. 755,
 Colt's foot.
 Petasites,
 Tussilago Petasites M. 756,
 Butterbur.
 Benzoinum.
 Styrax calamita.
 Balsamum Canadense.
 Balsamum Tolutanum.

XIX. EMETICA.

1. EX FOSSILIBUS.

Cuprum,
 Hydrargyrus,
 Antimonium,
 Zincum.

2. EX VEGETABILIBUS.

Asarum.
 Erigerum,
 Senecio vulgaris M. 756,
 Groundsel.
 Ipecacoanha,
 Psychotria emetica M. 314,
 Ipecacuanha,
 Nicotiana.
 Scilla.
 Sinapi.
 Raphanus rusticanus.
 Sales alkalini volatiles.
 Amara.

XX. CATHARTICA.

1. *Mitiora.*

Acescentia.
 Fructus acido-dulces recentes.
 Cassia Fistularis siccata,
 Cassia Fistula M. 393,
 Cassia of the cane.
 Tamarindus,
 Tamarindus Indica M. 81,
 Tamarind.

Dulcia.

Saccharum.
 Mel.
 Manna,
 Fraxinus Ornus M. 918,
 Manna.

Cathartica.

- Radices dulces.
 Olera blanda.
 Rosa damascena,
 Rosa centifolia M. 474,
 Damask rose.
 Viola,
 Viola odorata M. 803,
 Sweet scented violet.
 Polypodium,
 Polypodium vulgare M. 935,
 Polypody.
 Serum lactis.
 Lac ebutyratum.
 Olea expressa blanda ex Vege-
 tabilibus.
 ex animalibus.
 Sapo albus Hispanus.
 Sinapi nigrum.
 Sulphur.

Salina.

- Tartarus.
 Alkalina fixa,
 Magnesias alba.
 Sales neutri.
 Aquæ minerales salinæ.
 Amara.
 Bilis animalium.
 Balsamica.

2. *Acriora.*

- Aloe,
 Aloe perfoliata M. 337,
 Socotrine and hepatic aloes.
 Rhabarbarum,
 Rheum palmatum M. 385,
 Rhubarb.
 Seneka,
 Polygala Senega M. 640,
 Rattlesnake root.
 Genista,
 Spartium Scoparium M. 644,
 Broom.
 Sambucus,
 Sambucus nigra M. 295,
 Common elder.
 Ebulus,
 Sambucus Ebulus M. 295,
 Dwarf elder.
 Ricini Oleum,

Cathartica.

- Ricinus communis M. 865,
 Castor oil.
 Senna,
 Cassia Senna M. 393,
 Senna.
 Helleborus niger,
 Helleborus niger M. 519,
 Black hellebore.
 Jalapium Ph. Lond.
 Jalapa Ph. Edin.
 Convolvulus Jalapa M. 201,
 Jalap.
 Scammonium,
 Convolvulus Scammonium M.
 200,
 Scammony.
 Rhamni baccæ,
 Rhamnus Catharticus M. 232,
 Buckthorn berries.
 Gambogia,
 Gambogia Gutta M. 490,
 Gamboge.
 Nicotiana.
 Helleborus albus.
 Colocynthis,
 Cumus Colocynthis M. 869,
 Bitter apple.
 Elaterium,
 Memordica Elaterium M. 868,
 Elaterium.

Metallica.

- Ex Auro,
 Ex Argento,
 Ex Hydrargyro,
 Ex Antimonio.

Emetica.

XXI. DIURETICA.

a. *Umbellatæ.*

- Petroselinum,
 Daucus,
 Fœniculum,
 Pimpinella.
 Eryngium.

b. *Stellatæ.*

- Aparine,
 Rubia.

c. *Varia.*

- Alkekengi,

Diuretica.

Physalis Alkekengi M. 222,
 Winter cherry.
 Bardana,
 Arctium Lappa M. 723,
 Burdock.
 Dulcamara,
 Solanum Dulcamora M. 223,
 Bittersweet.
 Gramen,
 Triticum repens M. 127,
 Quickgrass.

Varia.

Lithospermum,
 Lithospermum officinale M.
 185,
 Gromwell.
 Ononis,
 Ononis spinosa M. 651,
 Restharrow.
 Arum.
 Asarum.
 Asparagus.
 Digitalis,
 Digitalis purpurea M. 562,
 Foxglove.
 Enula campana.
 Genista.
 Nicotiana.
 Persicaria.
 Ranunculus.
 Ruta.
 Sabina.
 Senega.
 Scilla.
 Amara.
 Balsamica.
 Siliquosæ.
 Alliaceæ.
Ex. Animalibus.
 Cantharides,

Diuretica.

Millepedæ,
 Sales acidi.
 Sales alkalini fixi,
 Sales neutri,
 Sapo albus Hispanus,

XXII. DIAPHORETICA.

Calendula,
 Calendula officinalis M. 791,
 Marigold.
 Crocus.
 Dulcamara.
 Opium.
 Camphora.
 Contrayerva.
 Serpentaria.
 Salvia.
 Scordium.
 Guaiacum.
 Sassafras.
 Senega.
 Moschus.
 Acida vegetabilia.
 Alkali volatile.
 Sales neutri.
 Olea essentialia.
 Olea empyreumatica.
 Vinum.
 Alcohol.
 Antimonium.
 Diluentia.
 Hydrargyrus.

XXIII. MENAGOGA.

Aloe.
 Gummi fœtida.
 Plantæ fœtidæ.
 Crocus.
 Castoreum.
 Ferrum.
 Hydrargyrus.

A TREATISE
OF THE
MATERIA MEDICA.

HAVING thus finished all that seemed necessary by way of introduction, we now proceed to enter more directly upon our subject, and shall divide our work into two parts; the one treating of aliments, the other of medicines: The former being, as we have said, such substances as are suited to supply the matter, whether solid or fluid, of the human body; and the latter being such as have no such property, but are capable of variously changing the state of the body, and particularly of changing the state of disease into that of health. It is true, indeed, that this last mentioned purpose may often be obtained by a certain management of alimentary matters, which thereby become medicines and subjects of the *materia medica*; and we shall have frequent occasion to view them in this light. But still it will be also proper to consider them separately; and we shall begin first with treating of the aliments.

PART I.
OF ALIMENTS.

CHAPTER I.
OF ALIMENTS IN GENERAL.

WE have already said that aliments are those substances which, taken into the body, are fitted to afford and supply the fluid and solid matter of it. On this subject it might be supposed at first sight, that these aliments should be distinguished according as they are fitted to supply the matter of the solid or of the fluid parts; but upon further consideration, the marking of such a distinction will not be found necessary. It is sufficiently evident with respect to the alimentary matters taken into the body, that if they be in a solid state, they must, in order to their distribution and proper application, be by the powers of the animal œconomy converted into a fluid form: and as it is also obvious that this does constantly take place; so it will readily appear that the matter fitted to form the solids makes always a considerable portion of the fluids. It is the production of these last, therefore, that we are first to account for; and I expect that in doing this we shall be able to account also for the production of the matter suited to form the solids.

When we consider the whole of the fluids of the body, they appear to be of many different kinds; but we can particularly distinguish those that are pretty constantly in the course of the circulation, which we call the *common mass*, from those that are found in other vessels than those concerned in the circulation. These, however, being all of them, as we presume, drawn from the common mass, and therefore originally of the same matter, only somewhat changed by the secretory organs through which they pass; so we shall omit considering them any further here, and shall enquire at present only into the nature and production of that matter which forms the circulating or common mass.

To this purpose it is to be observed, that besides elementary water, which always makes the largest portion of the human fluids, the next considerable part of the common mass is what we have named the gluten or coagulable lymph. This I consider as the chief part of the mass, because I suppose it to be that part of it which gives the matter of the solids, or the permanent constituent parts of the body, and which, from the beginning to the end of life, are constantly receiving a further accretion and increase. That the gluten is that part of the fluids which affords the matter of the solids, is sufficiently probable from this, that in all its qualities it very nearly resembles the solid matter of the body, while in any other part of the fluids there is no such resemblance. Therefore this gluten we hold to be the chief part of the fluids; and considering how much of it is diffused among the other fluids, and how much of it is dissolved in the serum or serosity, it is certainly, next to the water, the largest portion of the common mass. It may consequently be viewed as that into which the aliments, so far as they are nutritious, are converted; and therefore may be considered as the proper *animal fluid*. Under this title, we shall hereafter speak of it; or, to avoid all ambiguity, I shall frequently call it the *animal mixt*.

In order to account for the other matters that appear to be in the common mass, we must observe, that when this animal mixt is fully formed, it does not long remain stationary in that condition; but seems to be constantly, although perhaps slowly, proceeding to a putrid or putrescent state; as we know that if fresh aliment be not constantly supplied, the whole of the fluids will in no long time become very putrid. In this progress, as in other processes of putrefaction, we find the mild and perfectly neutral substances changed into a saline state of the ammoniacal kind; and this saline matter being washed off from the entire gluten, by the water which constantly accompanies it, seems to form the *serosity* of the common mass. It is this again which nature, in order to prevent an undue accumulation of it, has provided for being carried out of the body by the several excretions, and that in the proportion necessary to preserve the health of the system.

We thus find that the portion of the common mass, which is termed the serosity, and which seems different from the gluten or animal mixt, is however formed from this, and does not therefore lead us to suppose any other supply of alimentary matter than what is necessary to that.

To account for another portion of the common mass, we must remark, that the animal fluid is considerably different in its qualities from the vegetable matter of which it is often entirely formed, and that this vegetable matter, after it has been taken into the body, is thus changed by the peculiar powers of the animal œconomy. This change, however, is only gradually and slowly made; and it is not completed till the aliments and chyle made of them are taken into the blood-vessels; and probably even in these, it requires some time to be finished. From hence we may perceive that a portion of the common mass is always for some time in an unassimilated state: and we have thus a view of the common mass as being made up of three several parts; the one being a portion of unassimilated matter, which is to be formed into the animal mixt; the second being the animal mixt completely formed; and the third being formed from that mixt in its progress towards putrefaction. Although, therefore, the matter may be seemingly different in its different states, we find nothing to lead us to doubt of its being always made of the same alimentary matter.

As it appears probable that the whole of the circulating or common mass consists very entirely of the matters just now mentioned; so we are disposed to conclude that a different kind of aliment is not necessary to form the fluids from that which is necessary to form the solid parts of the body.

In admitting this, however, a difficulty will occur from our observing that there is a portion of the common mass, and that also constantly, present in it, which is peculiarly different from the gluten in any of the states of it which we have mentioned. This portion of it is that of the *Red globules*; the formation of which, from any state of the gluten, cannot, so far as I know, be explained; and it might therefore be supposed, that a peculiar kind of alimentary matter afforded this peculiar portion of the blood. It may possibly be so; but so far as I am acquainted with the subject, we do not know any part of the alimentary matters that seems adapted to this purpose: and as the red globules seem to be commonly in the same proportion to the gluten, and, the vigour of the constitution being given, that the quantity of both is in proportion to the quantity of the same kind of aliment taken in; so we may presume that the red globules, by certain powers of the animal œconomy, are made of the same aliment as the gluten. Again, therefore, I conclude, that there is no ground for supposing the aliment supplying the fluids of the com-

mon mass to be anywise different from that which is fitted for supplying the matter of the solids.

Another question, however, might still arise, which is, Whether any of the secreted fluids, found out of the course of the circulation, but necessary to the animal œconomy, require an aliment different from what is necessary to form the fluids of the common mass in the manner we have supposed? The negative of this we cannot, indeed, assert; but can justly say, that the affirmative is a gratuitous supposition without any proof. Indeed, while we can account for the production of the common mass from the aliments taken in, and at the same time pretty clearly perceive that the whole of the secreted fluids are drawn entirely from that mass, it will be with greater probability supposed, that the secreted fluids are, by the wonderful power of secretion, formed out of the common mass by a combination of the different states of that, or of different secretions, than that any of them are formed of peculiar aliments. Upon the whole, therefore, I again conclude, that the solids, and the whole of the fluids, are formed out of one and the same kind of aliment.

To ascertain exactly what that common aliment is, or if ascertained, to explain how it is adapted to its purpose, may perhaps go beyond our power: but in all such enquiries upon an analytical plan, it may be of great advantage to simplify the question as much as may be, and to begin at least with reducing the enquiry to the fewest questions possible.

Upon this plan, therefore, I enter upon the general question, What are the proper aliments of the human species? In answer to this, we know in general from experience, that the human aliments are taken entirely either from other animals, or from vegetables, and that no part of them, excepting water, is taken from the fossil kingdom. The substances employed are seemingly various; and in order to know the greater or less fitness of the individuals, it is requisite to consider in general how animal and vegetable matters are suited to give nourishment to the human body.

With respect to the former, the most part of the matter taken from animals is so nearly of the same qualities with the matter of the human body, that there is little difficulty in supposing that the animal matters taken into the human body, as aliments, are perfectly well suited to this purpose, and require only the means of solution and mixture, with very little change of their qualities. It is true, indeed that in many of the animal substances we take in, the likeness of qualities to those of the human body is not always exact and complete; and we shall hereafter have occasion to take notice of this: but in the meanwhile, all of them agree so much in the qualities which chiefly characterise the human fluids, that we may presume on their being a matter so nearly the same, that the former may be very well suited to supply the latter.

To supersede, however, any further anxious enquiry upon this subject, we may remark it to be highly probable, that all animal matter is originally formed of vegetable; because all animals either feed directly and entirely on vegetables, or upon other animals that do so. From hence it is probable, that all animal substances may be traced to a vegetable origin; and therefore if we would enquire into the production of animal matter, we must first enquire in what manner vegetable matter may be converted into animal? And this question relates especially to the human body; the nourishment of which is in a great measure immediately taken from vegetables.

In attempting this, we shall find that the conversion mentioned is the effect of a peculiar power in the animal œconomy; which, it must be acknowledged, is by no means clearly or fully understood. We shall, however, make some steps towards understanding it better; and to this purpose there is one step absolutely necessary, which is, to determine amongst the seemingly great variety of vegetable matter, which is the kind that is especially, or perhaps only, fitted to be converted into animal? Or if this question, as thus put, be too general, it may then be to determine, what are the vegetable substances chiefly fitted for being converted into the substance of the human body? Nothing is more evident than that every vegetable, or every part of any one vegetable, is not suited to this last mentioned purpose; and therefore it is necessary, both for the sake of the general question, and also for the particular purpose of the *materia medica*, to determine as well as we are able what vegetables, and what part of them, are most fit for the nourishment of the human body.

In pursuing this enquiry, it is to be remarked, in the first place, that for the most part those vegetables are rejected from the list of aliments, that are imbued with any strong odour or taste; and at least of the *sapid*, all except the acid and sweet are excluded. To this perhaps there are a few exceptions; as when the odorous or *sapid* part is in small proportion to the rest of the vegetable substance; when the odorous or *sapid* parts are such as pass quickly out of the body again by the excretions; or when they are such as admit of their qualities being entirely changed by the powers of digestion in the first passages. Such exceptions, however, hardly affect the general doctrine; which is very much confirmed by this, that several vegetables, which in their *acid* state are unfit or even noxious, by being deprived of their acrimony by culture, by blanching, by drying, or by boiling are rendered quite proper: and if there shall still be exceptions not to be accounted for in any of these ways, I would maintain, that such *acid* substances are admitted and taken in as condiments rather than as nutriments.

This consideration of the exclusion of *acid* matters from among our foods, is to be applied in this manner. As the *acid*,

odorous, or sapid parts, seem for the most part to be the peculiar matter of particular vegetables, and to be even but a small portion of these, seldom diffused over the whole, but deposited in certain parts of them only; and as this is more especially the case in those vegetables which are taken in as food; so we from thence conclude, that besides these peculiar matters, there is in the most part of vegetables a considerable quantity of matter, which, for reasons to be given hereafter, is manifestly in common to almost the whole of the vegetable kingdom. This we shall speak of as the common matter of vegetables; and having laid aside as above the peculiar, it is in the common matter that we are necessarily led to seek the vegetable substance that is suited to the nourishment of the human body.

Whilst from this consideration it appears that a great portion of vegetables is of an alimentary quality, at the same time it is from daily experience evident, that certain vegetables contain a greater portion of this alimentary matter than others, and that certain parts of vegetables contain more of it than other parts of them.

It is therefore further necessary to enquire after the particular substances of vegetables, or the particular parts of them that may be considered as the alimentary matter especially adapted to the human body.

In attempting this, it must, in the first place, be observed, that contrary to what others have supposed, I cannot discern that any portion of matter is to be found existing in any vegetables directly fitted to supply the animal fluid. This, however, as we have already said, is seemingly, together with water, the foundation of all other fluids in animal bodies; and particularly, that from which the nutritious matter applied to the increase of the solid parts is, by the powers of the œconomy, formed and prepared. It is this animal fluid, therefore, that our vegetable food is to be converted into; and it seems to be a matter formed not from any one kind, but by the powers of the animal œconomy, from various kinds of vegetable matter. Accordingly, when we are to say that certain parts of vegetables are alimentary, we mean only to say, that they are matters fitted to enter into the composition of the proper animal fluid.

In studying this subject, it appears that the matter of vegetables, whether in the whole or in the different parts of them, fitted to form the animal fluid, is an acid, a sugar, and an oil.

These three substances I shall now consider more particularly; and shall first endeavour to show that they truly enter into the composition of the animal fluid.

ARTICLE I. *Of Acid.*

That this is a part of the common matter of vegetables which proves alimentary, will be readily admitted, because it appears in the whole substance of many of our vegetable foods, and particu-

larly is frequently very copious in vegetable fruits. In these, indeed, it is commonly combined with more or less of sugar; but from what happens in the progress of the maturation of fruits, which is often the change of an acid into a saccharine matter, it is to be presumed that an acid enters largely into the composition of sugar, and is thereby, as will be shown hereafter, a necessary ingredient in the composition of animal fluid. It may perhaps be alleged, that it is only such an ingredient as being a part of sugar; but it seems probable that it is also such in its separate state. It seems, indeed, sufficiently proved, that every kind of vegetable aliment, except the purely oily, is capable of an acescent fermentation; and that every such aliment soon after it is taken into the stomach of an healthy person, undergoes such a fermentation; whereby an acid is always more or less evolved. At the same time it must be allowed, that as in the further progress of the aliment this acid disappears very entirely, without being ever again evident in the mass of blood; so its having entered into the composition of the animal fluid can hardly be doubted: and if this appearance and disappearance of acid constantly takes place, we may, I think, conclude from it, that an acid, purely as such, is a necessary ingredient in the composition of the animal fluid.

The same thing appears likewise from this, that acescent substances are so far a necessary part of the human aliment, that without these the animal fluid advances much faster and further towards a putrid state: and it appears more clearly still from this, that when the fluids have proceeded too far in their putrescency, so as to form a disease such as I take the scurvy to be, we know that this state is especially cured by the taking in of acescent aliment. It may perhaps be cured by every kind of such aliment; but still it is done most effectually by those in a very acid state, either produced by nature, as in lemons, or by vegetables converted by art into an acid state, as in sour kraut. In the use of these, as there is no evidence of their acting otherwise, they must certainly operate by entering into the composition of the animal fluid, and by rendering it of a less putrescent kind. It is upon the whole, therefore, extremely probable, that a vegetable acid in every shape is a proper and necessary part of the human aliment.

It is, however, proper to remark here, that this conclusion respects the native acid of vegetables only; for we have reason to believe that the several fossil acids do not enter into the composition of the animal fluid, not only because they readily pass unchanged by the excretions, but because even in the circulation they continue separate from the other parts of the blood, so much as to irritate ulcers and issues; and lastly because they do not cure the scurvy.

How it may happen with respect to the phosphoric acid, the

acid of borax, of amber, and some others, we do not very certainly know; but I am inclined to be of opinion, that all these just now mentioned are precisely in the condition of the solid acids. It is to be suspected, also, that it is the same with regard to certain acids that may be called vegetable; such as the acid of tartar, the distilled acid as it is obtained from tar, and even that it is so likewise with respect to the fermented acid or vinegar, when taken in large quantity. If the latter, as has been alleged, is found to increase coughing, it would show that it remains in a separate state, and thereby stimulates the bronchiæ: but it is likely that this happens only in consequence of its being taken in very large quantity: for it is very probable, from its being so largely employed in diet by a great part of mankind, that it enters even in large quantity into the composition of the animal fluid. Upon the whole, therefore, it would appear that the alimentary quality of acid is confined to the native acid of vegetables, as it is produced in them by nature, or as it is evolved from acescent vegetables, or from sugar in the stomach. Upon this occasion, what notice is to be taken of the aerial or mephitic acid, I am not well determined to say.

ARTICLE II. *Of Sugar.*

The second kind of vegetable matter which we have said may be supposed to be alimentary, is sugar. Whether this in its pure saline state, and taken by itself, without any mixture of oleaginous matter, can prove alimentary, seems to me very doubtful: but that even when approaching very nearly to a saline state, as it is in the sugar-cane, it may prove alimentary, is presumed from what happens to the negroes upon our sugar plantations, who are observed to grow plump and fat when, during the expression of the canes they take a great deal of the cane-juice.

The same conclusion may be drawn likewise from this circumstance, that the people of warmer climates live much upon fruits, whose substance in a great part consists of sugar; and I think it evidently appears that these fruits are more nourishing in proportion as they contain more of sugar. That sugar enters for a large share into the nourishment of men, we may know particularly from hence, that figs, a very saccharine fruit, were anciently the chief food of the *Athletæ* or public wrestlers.

That the roots of those vegetables that are especially alimentary contain a great deal of sugar, we learn from Mr. *Margraaf's* experiments, which show that a great deal of pure sugar may be extracted from them; and it can hardly be doubted that a great part of their nutritious power depends upon this ingredient in their composition.

The best proof, however, of the nutritious quality of sugar, or of its being a chief part of alimentary substances, is, that a great proportion of sugar is contained in all farinaceous matter. This

appears from its being involved in the most part of the farinaceous seeds by their germination or malting. And lastly, that all alimentary vegetables do for a great part consist of sugar, we may presume from their being universally liable to a vinous or acetous fermentation; the subject of which is probably in all cases a sugar.

The affinity between saccharine and farinaceous matter appears particularly from this, that several fruits, which, at a certain period of their maturation, are chiefly saccharine, are in their further progress often changed to a farinaceous state. The germination of seeds, therefore, and the maturation of certain fruits, fully prove the mutual convertibility of sugar and farina into one another.

While we thus endeavour to show that farinaceous substances contain a large proportion of saccharine matter, it is to be observed that the farinaceous seeds are, of all other vegetable matters, the most powerful and nourishing to men, as well as to domestic animals; and hence the *Farina Alibilis* of Dr. Haller. This nutritious quality he indeed imputes to a mucilaginous or gelatinous matter which appears in them upon their being diffused in water; and it is possible that their nutritious quality may in part depend upon this: but at the same time, from what we have just now said of the composition of farinaceous matter, it will appear that this vegetable mucilage or gelatina consists for a great part of sugar; which therefore, may still be the basis of its alimentary part. We allow it, however, to be also probable, that farina consists of another matter, which may be supposed to give the whole its gelatinous appearance in solution, and probably also to render the whole a more proper, complete, and powerful nourishment to the human body. This other ingredient of farina is probably an oil of the mild and unctuous kind that is got from farinaceous seeds by expression; and is therefore commonly named by the general title of an Expressed Oil.

ARTICLE III. *Of Oil.*

This leads us to consider what we suppose to be the other part of vegetable aliment. If farinaceous matter prove, as I have alleged, the most nourishing of vegetable aliments, it is equally evident that the most oily of vegetable seeds are the most nourishing of the farinacea; and from hence it will be sufficiently probable, that oil, such as the expressed we have mentioned, makes a considerable part of our vegetable aliments.

Here, however, it may be imagined, that oil enters into the composition of the animal fluid only as it is a part of farina, or as it happens to be mixed by nature with other vegetable matter; and that, as it is taken in, whether from animals or vegetables in a separate state, it affords only the oily matter that is necessary to be constantly present in considerable quantity in the bodies of animals, not for their nourishment, but for certain other purposes of their æconomy.

We cannot, however, enter into this opinion: for we are persuaded, that even the oil which is taken into the body, in the form of a pure oil, though entirely separate from other vegetable matter, does truly in a large proportion enter into the composition of the animal fluid; and that oil, therefore, may be considered in the strictest sense as a fundamental part of the human aliment.

We are of this persuasion, how much soever neglected by physiologists, from the following considerations.

1st, We observe that oil, both from vegetable and animal substances, is daily taken in as a part of diet by the people of all nations, and often in large quantity, without increasing obesity. It appears likewise that this oil does not remain separate from the other fluids of the alimentary canal, but it is very accurately diffused in the chyle; which may be considered as a step towards a more intimate mixture.

2dly, That such a mixture actually takes place is very probable from this, that no chyle appears in the left ventricle of the heart, nor in the arteries and veins which carry the blood which had passed through that ventricle. If there be some instances of such appearance, which have been alleged, they are certainly, however, very rare, and probably morbid.

3dly, Not only no chyle, but neither does any oil ever appear in any part of the mass of blood, nor ever in any part of the human body, till it appears in the cellular or adipose membrane, into which it is probably brought by a peculiar secretion. It has indeed been alleged, that oil has sometimes appeared on the surface of extravasated blood or serum; but in all such instances, we presume it to have been a preternatural appearance: For in the many hundred instances in which I have looked upon the human blood, I have never met with any appearance of that kind; and whilst oil is so constantly and copiously taken into the body, nothing can account for the absence of its appearance, but the supposition of its having undergone an intimate mixture of it with the other parts of the blood.

Some physiologists have been fond of finding the red globules of the blood to be an oily matter; and in certain conditions these may appear to be inflammable: but a fluid readily, equally, and permanently diffusible in water, cannot be properly considered as an oil.

A *fourth* consideration that leads to suppose the oil taken in, to be intimately mixed with the other parts of the animal fluid, and to make a considerable part in the composition of it, is this, that the oil, which is often copiously laid up in the adipose membrane of healthy animals, is again, upon various occasions, absorbed and taken into the course of circulation. Some of these occasions are manifestly those states in which a great degree of acrimony prevails in the mass of blood, as in scorbutic, siphylitic, hectic, and other such cases; and while it is highly probable that

the purpose of such absorption is by the oil to cover the acrimony of the animal fluid, it must prove at the same time that this admits of an intimate mixture with the oil.

As the want of food is a principal occasion of the absorption mentioned, this affords a proof that such absorption is a means of supplying aliment, or at least of covering the acrimony which upon the want of aliment is ready to take place. Upon either supposition, it affords a proof that oil unites very intimately with the other parts of the blood: and, upon the whole, there can be little doubt that oil taken in, either in its separate or united state, is a part, and a considerable part, of the human aliment.

We have now endeavoured to determine that there are three kinds of vegetable matter which separately, or rather as united together, afford the proper aliment of man; and we are disposed to say there are no others: but it has been, and still may be, by many suspected, that there is a fourth species of vegetable matter which should be taken into our accounts; and that is the mucilaginous part of vegetables.

It seems indeed to be very well ascertained, that gum Arabic, the most simple and pure mucilage, is an alimentary matter; and and as a gelatinous matter is commonly supposed to be the form in which our nutritious juices is applied, it may be supposed that this mucilage of gum Arabic is to be considered as a simple substance, and in the same form directly applicable to the nourishment of the body. Perhaps it may be so; but many objections may be raised against the conclusion. At present it will be enough to say, that the gum mentioned is not a simple substance, but a compound of acid, sugar, and oil, and that thereby only it becomes nutritious. In its powdery form it resembles farina; and a further analogy may be drawn from hence, that salep in its entire form resembles very exactly the gum, and in its powdery form comes still nearer to the appearance and properties of a farina. The conclusion of a similar nature in these substances will be still more readily admitted, when it is considered how nearly the amylaceous part of farina resembles the salep and gum in a powdered state; and it may be readily admitted, that the only difference between gum Arabic and farina may be a little difference in the proportion of the several parts composing each. It may be supposed, therefore, that gum Arabic, and other such mucilaginous matters may be like farina, chiefly composed of sugar and oil, which the vegetable æconomy may combine in different proportions, and under different appearances, which we cannot either imitate or explain.

This further remark is to be added, that gum Arabic contains a portion of sugar seems probable from the experiment which shows, that an acid exactly resembling the acid of sugar may be extracted from the gum, by a process like to that which extracts the acid from sugar itself.

It is again, therefore, concluded, that the vegetable matters affording aliment or acid, sugar, and oil, which in diet may be taken in, sometimes in their separate state; but may also, as they are more commonly, and perhaps more properly, be taken in a combined state; and in the latter case, either as they are combined in vegetable substances by nature, or as they are joined together by the cook in the preparations of diet.

Some time ago we should have rested in this conclusion; but the experiments of *Beccaria*, confirmed by *Kesselmaier* and many others, have discovered a substance in certain vegetables, which probably make a part of the nourishment which they afford. Although this peculiar matter has hitherto been discovered almost only in wheat, it is probably also in some proportion present in the other farinacea; as these are all of them coagulable and nourishing, and many of them are nearly if not as much, nutrient as wheat is. But however this may be, the discovery of *Beccaria* can amount to this only, that besides the parts we have assigned, there may be in certain vegetables a substance that makes a part of the aliment they afford; and justly indeed, as this newly discovered matter in its nature approaches more nearly to the nature of animal substance than any other part of vegetable matter we know of: but with all this we cannot find that this discovery invalidates our opinion of the chief part of the aliment afforded by vegetables being afforded by acid, sugar, and oil, to be compounded by the powers of the animal œconomy.

Besides the consideration of alimentary vegetables with respect to their constituent parts, there may be another general consideration of them proper here, and that is with respect to their being of different degrees of solubility in the human stomach.

What may be the power of the gastric menstruum, or the causes of its different power with respect to different substances, is not well ascertained: but we now know that it is different in different animals, insomuch that in many carnivorous animals it has little power with respect to vegetable matters; and that in phytivorous animals it has little power with respect to animal substances. See *Stevens De Alimentorum Concoctione, Edinb. 1777.*

Although in the human stomach the gastric menstruum seems commonly to have power with respect to both animal and vegetable matters, it is, however, probable, that upon different occasions its power is in a different degree with respect to these different substances; as it seems at certain times to dissolve the one more readily than the other. What this depends upon, or under what different modifications it may appear, we cannot at present venture to determine.

At present it seems further necessary to remark, that with respect to perhaps every human stomach, the powers of it in general being given, there is a difference in the solution of different

substances, arising entirely from the different texture of these. Thus it appears, that apples and melons are less readily soluble than strawberries and raspberries; that full grown cabbage is less soluble than collyflower; and a like difference may be observed with respect to many other vegetable substances, as we shall hereafter take notice of more particularly. In the mean time it may, in illustration of the whole, be in general observed, that in many vegetables there is a different solubility in the different parts of them; so that in one and the same, while a certain part of them is entirely dissolved, another part of them passes off by stool in a very entire state. Thus as many fruits consist of a tender pulp inclosed in a firmer membrane or husk, so the solubility of the whole will depend upon the proportion of these parts: and as in the maturation of fruits their pulp goes on increasing, while their membranes are constantly growing thinner and tenderer; so in many instances the solubility of fruits taken in an entire state will commonly be in proportion to their maturity.

In illustration of this subject of the solubility of aliments, it may be remarked, than in so far as the arts of cookery render the texture of aliments more tender, it renders them in proportion more soluble in the stomach.

At entering upon this subject, I should have observed, that we have a particular proof of the more ready or difficult solubility of different substances in the stomach. There are men who are occasionally, and many who are very frequently, liable to a rumination, or the bringing up by an eructation a part of the contents of the stomach. These parts are frequently somewhat entire portions of vegetable or animal matters, which are manifestly of a firmer texture than the rest which had been taken down, and have not therefore been so readily dissolved. From the rarefaction of their air not entirely extricated, they float near to the upper orifice of the stomach, and are therefore most readily brought up. I have known several persons liable to this rumination, and from them have learned, that certain substances are more commonly brought up than others, and some at a longer time after eating than others; and both circumstances seem clearly to depend upon the different degrees of solubility in these substances.

Having now finished the general consideration of alimentary matters, I proceed to the consideration of particulars.

CHAPTER II.

OF PARTICULAR ALIMENTS.

WE are to consider these under the separate titles of Meats and Drinks: and by the first we mean whatever, whether solid or liquid, may be considered as alimentary in the sense explain-

ed above; and by the second, what is especially, and almost only, fitted to give liquidity to the aliments, and supply the water necessary to the body. It is indeed true, that the liquids employed for that purpose may often also introduce nourishment: but under the title of Drinks, we shall consider the matter only as it affords a liquid.

The particular alimentary matters shall be considered under the two heads of Vegetable or Animal: but to these I shall subjoin the consideration of Condiments, which, though not alimentary, yet, as always taken in along with these, and giving a particular modification of them, they will be most properly considered immediately after the consideration of the proper aliments themselves.

SECT. I.

OF VEGETABLE ALIMENTS.

THE nature of vegetable aliment in general I have already considered very fully; and am now to consider the particular vegetables or part of vegetables in which it is to be found: but in the whole of this, we are to mention these parts of diet only which are well known and commonly employed in Britain. We have arranged them, in the first place, as they are taken from the different parts of plants; and at the same time we have endeavored, wherever we can, to mark the botanical affinities of the plants from whence they are taken. We have attempted also to arrange the several vegetable aliments according to the quantity of nourishment that each of them affords; beginning with those of the least, and proceeding to those which afford the greatest proportion of it: but in this respect we cannot execute our plan with any great degree of exactness and precision.

Having thus settled as well as I can the circumstances of order, we enter upon particulars; and first of the *Fructus Horæi* or Summer Fruits, or, as they may be properly named, the *Acido-dulces*.

A. a. *Fructus Acido-dulces, or Summer Fruits.*

The particulars to be considered here are enumerated separately in the table given above; but they have all of them so many qualities in common with one another, that it will be proper to consider these common qualities first, and afterwards what may be peculiar to any of the particulars.

They are all of them useful in quenching thirst, which they do partly by their cooling quality, and partly by their stimulating and drawing forth a liquid from the mucous excretories of the mouth and fauces. Taken down into the stomach, they have the same effect there; and sometimes further, by correcting putrescency, they remove a powerful cause of thirst.

In the stomach, our fruits give to the sensible parts a stimulus that excites appetite; and at the same time they prove refrigerant, and diminish the action of the sanguiferous system. This effect is from the stomach communicated to the rest of the system; and this, joined with their antiseptic power, renders them of the greatest utility in every kind of febrile disorder. Their power in this respect has been taken notice of by every writer on the subject; but whether they may be useful also in diminishing the tension of the system in other cases, is not determined. *Van Swieten's* observation of the effects of a large quantity of cherries in the cure of a maniac, and some other observations of the like effects of a large quantity of fruits, in certain melancholic cases, look like such a power. These effects, indeed, may be imputed to the constant diarrhœa which such large quantities of fresh fruits produce; but we are at the same time well persuaded of their general refrigerant and sedative power: and to this we ascribe their effects in the cases mentioned; in which opinion we are strongly confirmed by their power in producing dyspepsia and atonic gout. The same consideration also leads us to believe that in many cases they may favour the coming on of intermittent fevers, as *Galen* has alleged. There may indeed be many instances of their being used without their having had that effect; but it will still be certain that fresh fruits often show a debilitating power, which may certainly favour the operation of marsh effluvia, in bringing on agues, and readily occasioning a return of them when they had seemed to have ceased.

The effects hitherto mentioned, depend especially upon the acid present in the composition of fruits, and which acid we have asserted above to enter in a certain proportion into the composition of the animal fluid. It therefore becomes necessary in the stomach; but it may be there in excess, may increase the acescent fermentation which happens there, and may thereby give occasion to the production of more acid than the other fluids of the stomach can properly involve. In this manner, therefore, they may give occasion to all the disorders of an excess of acidity in the stomach, which physicians are very well acquainted with.

The acidity taken in, or naturally produced, always subsists in a certain measure in the stomach; but carried into the intestines is there mixed with the bile, by which it is more entirely involved: and as we know that acid united with the bile takes off its bitterness, it is probable that acid fruits taken in are often useful in obviating the disorders that might arise from the redundancy of bile, and perhaps from the acrid quality of it. On the other hand, however, if the acids are in greater quantity than can be or are, properly corrected by the bile present, they seem, by some union with that fluid, to acquire a purgative quality, that gives a diarrhœa, and the colic pains that are ready to accompany the operation of every purgative.

From the involution of acids, which even happens in the stomach, and more completely in the duodenum, we must perceive that, as we have maintained above, they are mixed with the human fluids; and the same also renders the other part of our doctrine probable, that they enter for a part into the composition of the proper animal fluid, to be thereby rendered less putrescent than it would otherwise be. Acids indeed are universally acknowledged to resist putrefaction; and hence the instinct of man leading him to the use of these fruits in warm climates, in warm seasons, and in every other circumstance that is known to increase a tendency to putrefaction. The state of the fluids in the scurvy may be disputed about: but the remarkable effects of vegetable acid and acescents in the cure of this disease do not allow us to doubt of their manner of operating, and therefore of the nature of the disease.

We have hitherto taken notice almost only of the acidity of the fruits we are considering: but that acidity is perhaps always accompanied with more or less of sugar; and thence perhaps more readily runs into a fermentation, by which their acidity, and all the effects of it mentioned, are greatly increased; and it is by the same fermentation that an unusual quantity of air is extricated, and gives occasion to the flatulency of the stomach and intestines with which the use of those fruits is so commonly accompanied. We often find, however, in fruits, the acidity accompanied with, or changed into, such a quantity of saccharine matter, that both from the reasons given above, and from universal experience, our saccharine fruits must be considered as particularly nutritive, and that also in proportion to the quantity of matter they contain. In what manner sugar enters into the composition of the animal fluid, or how it acquires the qualities it puts on in these, I cannot very clearly explain; but we can have no doubt that it does so in fact; and we are well persuaded that the saccharine matter, as well as the acid, has a share not only in obviating the putrescency of the animal fluid, but also of correcting it when it has gone too far. It is therefore justly supposed, that the resisting putrefaction and curing the scurvy are virtues in common to the whole of the summer fruits we are treating of.

We have now mentioned the qualities that can be properly taken notice of as common to the whole of these fruits; but there are some others mentioned by writers on the subject. Thus those that are accompanied with an agreeable odour are said to be cordial and analeptic. Their powers, however, in these respects are too inconsiderable to be mentioned; but I do not say so of the saponaceous and dissolving powers which are ascribed to them.

Upon this subject it is to be remarked, that the blood of phytivorous animals is perhaps more dense and cohesive than that of the carnivorous; and therefore it is difficult to determine what

is the effect of aliments in this matter: but I shall consider it more fully hereafter, when I shall consider in general how far the state of the fluids can be changed, either by aliments or medicines.

The qualities we have taken notice of in fruits have their effects chiefly in the first passages: even the changes they can produce in the mass of blood are all of them, if I mistake not, begun in the same first passages; and how far they have peculiar effects in the course of the circulation, I cannot well determine. We believe they have a tendency to increase the saline state of the blood; and therefore it is very possible that when they are taken in larger proportion than usual, they may shew diuretic powers; but we judge that such appear only when fruits carry along with them a large proportion of water, as in the case of the *Watermelon*.

Having thus considered the qualities in common to the whole of the summer fruits, the peculiarities of each will be best explained by considering what happens to the most part of them in the progress of their growth and maturation. Thus, the most part of fruits, upon their first discovering any succulency, have that more or less acerb: but upon their succulency being advanced, their is more acidity evolved, and less acerbity is perceived. As the growth of fruits advances, if they are such as are capable of acquiring sweetness, this appears more and more, while the acerbity and acidity are constantly diminishing, and sometimes in there state of perfect maturity, a full and almost unmixed degree of sweetness prevails.

With these changes of their juices, it is to be remarked, that at the same time fruits suffer a change in their texture. At first they are firm and dense: but as their succulency advances, they are constantly becoming more soft and tender; and with their maturity they acquire the most succulent and tender state they are capable of. In the most part of fruits, we can distinguish between the softer pulp and firmer cortical part; and in the progress of their maturation, we find their pulp, in the innermost parts, constantly increasing, while the firmer and external cortical part is constantly diminishing. After fruits have in these respects of their juices and texture acquired their maturity, they suffer some further changes, to a farinaceous or to a putrid state, which I cannot explain: but as these changes hardly give any qualities to be taken notice of, either in diet or medicine, I shall not attempt any account of them.

Having now taken notice of the changes that may happen to many individuals, the peculiarities that may take place in the several genera and species may be readily distinguished. Thus some fruits remain constantly in an acerb state, while others advance to a more pure acidity, hardly acquiring any sweetness. A third kind advances to a sweet state, still retaining more

or less of their acidity; while others retaining little or none at all of this, acquire a full sweetness. Upon these circumstances, as they take place in particular fruits, both the diætic qualities and medicinal powers of each may be ascertained by a little experience of the taste in all the several states of growth and maturity they are capable of.

It is to be further observed, that as the qualities of fruits, as alimentary, depend almost entirely upon the quantity of saccharine matter they can acquire, and this upon the greatest degree of maturity they can arrive at; so this will often depend upon the soil they grow in, and upon the climate and sun they have been exposed to. It is also to be remarked, that as the full evolution of their saccharine matter is the most perfect state of alimentary fruits; so whatever contributes to this, may be considered as giving them their utmost perfection: and therefore when in certain climates fruits cannot be allowed to remain upon their respective trees to acquire their due maturity, this, however, may be supplied: if fruits, when taken from a tree, can be preserved from frost or other cause of corruption, the process of maturation still goes on, and will go on to a more perfect degree in evolving the saccharine matter, and in giving a greater tenderness of texture. This is not always to be promoted by external heat applied; but in some cases it may: and we find that certain fruits when taken from their trees, if laid in heaps, so as by a certain fermentation to become heated, they by this sweating, as it is called, lose their acerbity, and acquire more sweetness than they would have otherwise had; and it is to the purpose of diet to observe that by the application of an artificial heat in boiling, baking, or roasting, acerb and unripe fruits have their saccharine matter much more evolved, and the effects of their unripe state very much prevented; particularly, as by these practices a great deal of their air is extricated and dissipated, they are less disposed to an æsculent fermentation.

It belongs also to the business of diet to remark, that persons do often take in unripe fruits in considerable quantity; and much has been said of the danger attending such a practice; which is certainly in some measure well founded. The firmer texture of these unripe fruits is more difficultly dissolved; they remain therefore long in the stomach unmixed with the other fluid: and they are therefore liable to acquire a greater degree of acidity, and to give all the disorders that may arise from that in too great abundance. There are indeed stomachs whose gastric liquor may obviate all this; but certainly in many cases it may fail; and therefore the taking in of unripe fruits is always hazardous, and may be very hurtful.

We can hardly omit here saying what may perhaps be understood from what has been said already, that though fruits in their ripest, be at the same time in their most perfect, state, they may,

however, even in this state, be taken in, in too large quantity; and in that case, being in over-proportion to the quantity or powers of the gastric liquor, they may go too far in an acescent fermentation, and give all the disorders that may arise from too acid fruits: and that this will especially happen from fruits which have still in their ripest state a large proportion of acid in their composition.

Having now said so much of the common qualities of summer fruits, I can have few observations to make on the qualities of particular kinds. These I have said will depend on the acerb, acid, or saccharine matter, in their constitution, whether that depends upon their specific nature or upon their state of maturation; and in all cases to be readily ascertained by experience in tasting.

For the sake of young students, we shall more particularly observe, that the Drupaceæ, or stone fruits, have commonly a larger proportion of acid with respect to their sugar than some other fruits: and therefore in their recent state they are commonly and justly supposed to enter more readily into a noxious fermentation, and to produce these consequences of morbid acidity, cholic, and diarrhœa, which we have mentioned above. This is especially, and perhaps justly, supposed with respect to the cherry and plumb kind, and we believe may be equally supposed with respect to the peaches produced in the open air in Britain; but we are disposed to judge the apricot in these respects to be the safest of the drupaceous tribe.

The Pomaceæ, when duly ripened, or when their immaturity is corrected by artificial heat and proper additions, may have all the common qualities of other summer fruits, but in their recent state, being seldom duly ripened in this climate, the firmness of their texture renders them slowly dissolved, and ready to contribute to an excess of acidity in the stomach. This vice happens more readily with respect to *Apples* than to *Pears*, as we can at least have some species of the latter more mellow and tender. In the case of a dyspeptic stomach, I have known apples a long time after they had been taken down, brought up again by eructation in the same masses they had been swallowed, and that even after two days.

Aurantium. This with the *Limonium*, I have inserted here amongst the Pomaceæ, though not with strict propriety, as the fruit is not a pomum. But in this instance, I have followed the learned professor *Murray*, who under the title of Pomaceæ has given not only the Poma, but also the Drupæ and Bancæ. How far this is proper, I will not determine: but for my purpose of considering the dietetic qualities of fruits, I thought it fittest to distinguish their botanic affinities as far as I could: but I could not find a more proper place for the *Aurantium* and *Limonium* than that I have given them here.

Both these plants, in their leaves and flowers, and in the exterior cortical part of their fruit, have various medicinal qualities; which, according to my plan, are not to be mentioned here; where I am to consider only the qualities of the juice of their fruits, the only part of them employed in diet.

The juices of these fruits we consider as purely acid, to be more easily collected in large quantity than from almost any other fruit; and therefore they are more frequently than that of any other employed. Wherever an acid is indicated and admissible, they answer every purpose which we have proposed above for acids in general, whether in the mouth and fauces, or in the stomach and intestines. They certainly enter into the composition of the animal fluid; and accordingly much experience has pointed them out as the most useful both in preventing and curing the scurvy.

They are of two kinds. One in which they are more purely acid, with very little saccharine matter joined to them: the other is that in which a considerable portion of sugar is joined with the acid; by which it may be considered as in some measure nutritive. This, however, is little attended to; and they are seldom employed as a nutriment. This only is to be remarked, that the *China or Sweet Orange* has, in a certain degree, every quality that can be ascribed to any of the fructus acido-dulces.

These are the virtues of these acids: but it must be observed, that wherever acids can be hurtful, these, either in undue quantity, or in dyspeptic stomachs, are as readily noxious as any other.

On the whole of the subject, I have only further to observe, that as the fruits mentioned are the fruits of a season, it is often necessary to preserve their juice in its entire acid state for some length of time; and for this purpose various measures have been proposed. What may be done by congelation I cannot determine, as it is very rarely that this climate allows of the experiment. The practice by evaporation, or the making it into a rob, has been that most commonly employed, and has been much commended by many persons; but in many trials which I have made, I could not exhale it to such a consistence as would preserve it without addition, without my finding the acid a good deal changed. It acquires an acerbity and stypticity that does not allow it to be readily diffused in water; and I suspect it is not so readily miscible with the animal fluids as in its entire state. From *Forster's* observations in the voyage round the world, it was not found useful either in preventing or curing the scurvy; which perhaps may be accounted for, partly by the concentration bringing it nearer to the state of the fossil acids, or possibly by the dissipation of some volatile parts, perhaps a portion of ærial acid; both of which circumstances may render it less fit for the cure of the scurvy. I have therefore

had a bad opinion of the acid exhaled to a thick consistence; and judge the best way of preserving its virtues to be by a diligent depuration of it from its mucilaginous part, and putting it up in close vessels without putting any oil on its surface, which is ready to be acted upon by the acid, and gives a disagreeable taint to it.

What in our catalogue are put under the title of *Senticosæ*, as their tender substance is easily dissolved, and that in their ripe state they do not exceed in acidity, are justly reckoned the safest of summer fruits. If the large annual use of *Strawberries* could preserve from the gout, we should seldom find the inhabitants of Edinburgh affected with that disease. But though they use that supposed preservative very largely, we find them as often and as severely affected with the gout as the inhabitants of other places who do not use the same. Under the title of *Senticosæ* I had formerly set down the *Cynosbatus*, as it still retains a place in some dispensatories; but after much attention, I cannot find that the best kinds of this various fruit possess any peculiar qualities that should introduce them either into diet or medicine.

Of the *Ribesia*, there is a considerable difference between the *Ribesia*, strictly so called, or currant, and the *Grosularia* or gooseberry. The former has always a large proportion of acid; and though it should be more sweet, as the smallness of the berry does not easily allow it to be taken without the husk, it is a less safe fruit: whereas the *Grosularia*, as commonly containing a larger proportion of sugar, and as it may be easily taken without the husk, affords a safer, and generally a very safe, fruit. To the *Ribes nigrum* some singular virtues have been ascribed; for which, upon repeated trials, I have not found any foundation.

The *Vaccinia* duly ripened, though retaining a good deal of acidity, are commonly easily digested; but the most agreeable species, the *oxycoccus*, or craneberry, is still safer in its preserved than in its recent state.

UVAE VITIS.

Every body knows that the Grape, according to somewhat specific in the nature of particular kinds, according to the soil it has grown in, the sun it has been exposed to, and its different degrees of maturation, is in very various condition; and the qualities therefore of it in its different states are to be judged of by the principles laid down above. But I think we may assert that Grapes, which contain a large proportion of sugar, are, if taken without their husks, the safest and most nutritive of summer fruits.

Of the fruits hitherto mentioned, except the *vaccinia*, I have considered them only as in their recent state; but it is proper to take notice of them also, as they are often used in a dried state. In this state their watery part, and perhaps their acid and air, is

in part abstracted: and therefore their powers are in a more concentrated and perhaps improved state.

Of these dried fruits, the *Prunes*, as they contain a great deal of the acid they originally had, are more of a laxative quality than the other dried fruits. Sugar, and therefore saccharine fruits, have all of them somewhat of the same quality. But we are persuaded that the laxative quality of fruits is commonly to be attributed to their acid conjoined with the bile, as above alleged.

Of *Passulæ Majores* or raisins, as very purely saccharine, they may be considered as considerably nutritive, and that in proportion as they are more entirely saccharine.

The *Uvæ Apyrenæ*, or *corinthiacæ*, otherwise named *Passulæ minores*, as having more of acid, are therefore with the nutritive quality of the raisin more laxative.

The *Date* of the best kinds is a very saccharine fruit, and their nutritious quality is well ascertained by the experience of many people who live upon them almost entirely. Those which come to us have, besides their nutritive, no peculiar quality of astringent or demulcent that I can perceive.

Dried *Figs* are a fruit containing a large proportion of sugar; and by the experience of many people, considerably nourishing. They are perhaps more so, that their sugar is united with a large portion of a mucilaginous matter, which we always suppose to be of an oily nature, and therefore contributing to a nutritious quality. The mucilaginous nature of Figs has given occasion to their being considered as demulcent; and both these and the dates have been much employed in pectoral decoctions, and for moderating the acrimony of the urine in nephritic cases; but we shall hereafter show, that the power of demulcents, both in these and other substances, is a very doubtful matter. In the mean time we are clear that the *materia medica* has lost nothing by our dispensaries omitting the *Sebesten* and *Fujubes*, dried fruits, somewhat of the same nature with the dates and figs, and formerly used for the same purposes.

To the consideration of the dried fruits, it is proper to subjoin the consideration of fruits in their preserved state; which is commonly done by means of some boiling, and afterwards adding to them a quantity of sugar. In this state they preserve sometimes their acid, and always their acescent and nutritive qualities; but both by the boiling employed, and the sugar added, they are perhaps less liable to acescency; and by the latter circumstance their nutritive qualities are certainly increased.

Some fruits are preserved by being laid in brandy, or other ardent spirit; but this hardly preserves in them any of their original qualities. Their acescency is entirely destroyed; and they are rendered absolutely unfit to be employed as nutrients.

To conclude the subject of fruits, we shall consider a question

which has been frequently stated, and that is, Whether recent fruits are most safely and usefully taken before or after a meal or the use of other food? The answer seems to be very obvious. In dyspeptic stomachs, or these which do not easily or powerfully overcome acescency, the taking in of acescents must be less safe before a meal than after it. In the case of stomachs powerful in the digestion of acescents, these may be commonly taken safely before meals, and possibly often with advantage, as they may excite appetite and favour digestion. In the most part of stomachs, fruits in moderate quantity are safe after meals; and when these have consisted of much animal food, the use of fruits is generally proper, though in certain dyspeptics the large use of them may not be always safe. The use of the dried fruits is certainly safer than that of the recent before meals; but even the dried fruits cannot be taken in that condition with sufficient safety by the dyspeptic. As I am well persuaded of the nutritious quality of dried figs, I can hardly believe, with Linnæus *Amæn*, I. 136. that a large quantity of these can be taken before a meal without any diminution, and rather with an increase, of appetite.

With respect to the use of fruits, there is still a question to be mentioned. In many countries, particularly in Britain, both recent, boiled, and preserved fruits, are often taken with milk: and this practice has been condemned by *Spielmann*; but as I judge, without reason. In this country, the practice is almost universal, without our observing any mischief arising from it. Such experience is the most secure foundation for concluding that the practice is not hurtful; but it may be further added, that the supposition of the consequences arising from it is not well founded. It is supposed they may arise from the coagulation of the milk in the stomach: but this happens to perhaps every portion of milk taken down into it; and therefore certainly happens for the most part without any bad consequence. Further, however, we judge the milk may be useful by involving a portion of the acid, as it has been often found to be a cure for heartburn. If it happens, as commonly, that the oily part of milk is employed, it is probable that the coagulum will not be very firm, and also that the acid will be more properly and fully involved. As we are persuaded that the animal fluid is always formed of acid, sugar, and oil, so I judge the mixture of these in diet to be not only allowable, but very proper; and therefore that cream with strawberries, and butter with apple-pye make a very proper diet.

Before going further, it is to be remarked, that in treating of the above alimentary substances, we have not followed the method of other writers on the *materia medica*, who, upon the occasion of mentioning substances as alimentary, do at the same time mention the medical virtues of the other parts of the vegetable from whence the alimentary matters are taken. This, how-

ever, appears to be distracting the student's attention; and we have avoided it, resolving in another, as we judge a more proper place, to take notice of the medicinal qualities that may be in the whole, or in the parts, of alimentary vegetables; and shall now, in considering the rest of the alimentary substances, keep to this measure.

After the fructus acido-dulces, the next set of vegetable aliments to be mentioned, are the fruits of the Cucurbitaceæ. This order, as we observed above, by no means shows the power of botanical affinity in giving the same medical virtues to every fruit of the same order; but these in our list, which are the chief of the alimentary substances taken from this order, are of a very similar nature with one another. They are not supposed to be very nourishing; but may be truly more so than is imagined: for though in the state in which they are employed, their sensible qualities do not promise much, I judge their substance to be of the nature of the farinaceæ, which are to be hereafter mentioned as the chief of vegetable aliments.

All of the Cucurbitaceæ, by a certain maturation, are changed into a farinaceous substance; and *Scopoli* informs us, that the substance of the pompon is employed by some people in the making of bread; and that one part of that substance, with two parts of wheat-meal, may be employed for that purpose.

The *Cucumber*, as commonly employed in its unripe state, is perhaps in that condition not very nutrient; but it is so much so as to make a considerable part of the aliment of many persons in warm climates and seasons: and its aqueous, cooling, and acescent quality, render it a very proper summer aliment. The firmness, however, of its texture, occasions it often to be long retained in the stomach: whence it frequently occasions acidity and flatulency, and is therefore properly accompanied with some of the condimenta.

The *Melon* in its ripe state discovers some sweetness, and may therefore be more nourishing. On the same account, however, it comes nearer to the qualities of the fermentable fructus acido-dulces; and as at the same time, from the firmness of its texture, it may often show the effects of two great acescency, moderation is necessary in its use, especially by dyspeptic persons; and I think it is commonly rendered safer by the addition of sugar and aromatics. Some writers have mentioned its diuretic effect; but I cannot find these from the Melon to be more than from other aqueous food. If *Sanctorius* found melons to diminish perspiration, they might thereby indeed increase urine, as he also observed; but all this I would impute to their refrigerant rather than to their directly diuretic powers. I have found no evidence of Melons stimulating the kidneys; and the account given by *Dr. Arbuthnot* of their giving bloody urine, is a single fact, and seems to be extravagant.

B. *Folia et Caules Plantarum.*

Of the leaves and stalks of plants, used as aliments, I have set down only a few, as of these kinds of plants few afford much nutriment; and in the list of nutrients given by writers, I find many of them which, both from their qualities and from the quantities in which they are employed, cannot be considered as nutrients so properly as condiments; and to that place I refer them.

Of the nutrients, I have set down a few under the title of *Oleraceæ*; having in view their botanical distinction, rather than the meaning of the term *Olera*, as formerly employed.

Of the leaves mentioned, and several others that might have been added to the list, they are all of them mild and almost insipid substances, with hardly any sweet or mucilaginous taste to discover a nourishing quality; but they are acescent and fermentable, and therefore must contain some portion of sugar. They contain however, so little, that they are justly supposed to be among the weakest nutriments. For the table, they are properly chosen by the tenderness of their texture; and therefore the *Spinage* is justly preferred, and is now almost the only one of these *oleraceæ* employed.

If the plant to which we give the name of *Malva* is the same to which the ancients gave that appellation, I think they made a bad choice in employing it as one of the *olera*; for it has hardly more mucilage than the *spinage*, and cannot by any boiling be brought to be so tender.

The *oleraceæ* are commonly said to be laxative: but they are no more so than any other vegetables capable of fermenting in the stomach, and that are taken into it in large quantity.

After the *oleraceæ* I have set down the *Brassica*, which, though I have distinguished it by its botanical order, is one of those which have been commonly named *Olera*, and is one of those which were anciently, and are still at present, in the most frequent use. I have marked it as one of the *Siliculosæ*, for the sake of observing, in proof of our general doctrine of vegetable aliments being those most free from acrimony, that the *brassica* is the most free from that peculiar acrimony which distinguishes all the other plants of the class of *Tetradynamia*. It is accordingly the only plant of the class whose leaves are employed as nutriments: and this circumstance of the mildness, fulness, and considerable sweetness of its juice, with the bulk in which it is produced, will readily shew why it has been at all times so much employed as an aliment.

One species of the *brassica*, designed by the trivial name of *Brassica Oleracea*, is supposed by culture and other circumstances to have been brought to be of many varieties which put on very various appearances, and all of which, for the purposes of the table, are cultivated in most of the countries of Europe.—

Whether the plants under these different appearances are different species, or varieties of one species only, I leave to be determined by the botanists; and whether they be of the one kind or other, I leave the more nice and accurate distinction of them to the men of that science. I am to speak only of those I am well acquainted with, and whose distinction I believe to be very commonly known and universally established over Europe.

In all the varieties of the *Brassica Oleracea*, I take the alimentary qualities to be very much the same. It is indeed possible they may differ in the quantity of it which they severally afford: but this I have not been able to ascertain with any precision. As all of them may be considered as a supplemental provision only, I believe they are seldom to be chosen by the quantity of nourishment they afford; and I think they are to be chosen as a part of diet by the tenderness of their texture, and by the fulness and sweetness of their juice. It is probable that on many occasions they are chosen by the bulk in which they may be produced, and by the facility with which they may be reared and preserved in certain soils and climates.

Upon the first ground, the *Collyflower* and *Brocoli* are to be chosen, as the most tender, most easily digested, and least flatulent.

Of all these kinds of which the leaves are especially employed, the *Brassica Sabauda*, or *Savoy*, appears to me to be sweeter and more tender than any of the others I am acquainted with; and in the *Savoy*, I hold the central and upper leaves gathered pretty closely together, to be by much the tenderest portion of the whole plant.

Those kinds of the *Brassica*, whose leaves, after a certain time of their growth, are gathered in greater quantity, and more closely, into a firm and globular head, are named *Brassicæ Capiatæ* or *Cabbage*, affording the greatest bulk of product, and perhaps the greatest quantity of nourishment.

As all the *Brassicæ* seem in a pretty firm texture, and in a very fermentable juice to contain a great quantity of air, they are all noted for producing flatulency in the bowels. As the younger plants are the most tender, so they are the least flatulent; and as the formation of cabbage requires a longer time in growing, so cabbage requires a firmer texture, and is noted for producing more acescency and flatulency than any other kind. Cabbages are by their colour distinguished into two kinds, the *white* and the *red*; and the latter is found to be of the sweeter and tenderer kind.

Since I first wrote the above, I have become acquainted with a species of *Brassica* that I was not acquainted with before. This is what has been called the *Brassica Gongylodes*, which, till I raised it in my own garden, was not, far as I can learn, known or produced in Britain. It is distinguished by its having on the upper part of its stalk a swelled part, or spheroidical tuber, which

within a firm cortical part is formed of a substance of the same nature with that which forms the medullary part in the stalks of cabbage and other kinds of colewort. This medullary part, when freed from its rind, and very well boiled, is of a tender and sweet substance, and certainly is considerably nourishing, and appears to me to be less flatulent than the cabbage. It is firmer in its consistence, and sweeter than the turnip; and though the hardness of its bark may render it unfit to be reared for the purpose of feeding cattle, I am of opinion, that under proper mangement it may afford a delicacy for the tables of men.

I have thus given the choice of the several species of the *Brassica*, so far as I am acquainted with them; and believe the principles I have made use of will apply to every other species, when their nature and different states are properly known.

We have only to remark further, that as we have said just now, that the whole of the species contain a great deal of air, they may be rendered fitter for diet by having a great deal of that air extricated and dissipated before they are employed in food.

This gives us an opportunity of observing, that our vegetable aliment of all kinds contains a great deal of air, which disposes them more to acescency and flatulency; and which they are more disposed to produce, as they are of a firmer texture, or as they are further advanced in their growth. The extrication, therefore, of a great deal of this air, before they are taken into the stomach, is always of great service in obviating the tendency mentioned. We have mentioned this particularly on the occasion of cabbage, so frequently accused of acescency and flatulency, but which may, by very long boiling, be rendered almost as safe as the tenderest vegetable. For the most part it may be rendered as safe as the collyflower, to which our cooks, for the sake of the figure it is to make upon the table, seldom give the boiling that is necessary to render it duly digestible.

Besides the boiling mentioned, there seems to be another means of extricating the air of cabbage, by subjecting it to a fermentation, as in the preparation of *Sauer Kraut*; a preparation so named in Germany, where for many ages past it has been a common part of diet.

This preparation has now been described in several books which are in every body's hands, and therefore need not be repeated here; and in this place it seems only to be necessary to say what are its qualities. As the matter has been subjected to an active fermentation, so a great deal of acid is evolved in it; and after what we have said above of acid as an alimentary matter, it will be readily allowed that sauer kraut may be considered as such. But as the whole of the matter is not thus converted, but that a great portion of the saccharine matter of the cabbage still remains in it, so it will be still more readily allowed, that

this preparation may be considered as alimentary, and well suited to the purposes to which it has been especially applied, that is, the obviating and curing the scurvy.

Another set of the leaves, or rather stalks, of vegetables, which are considered as alimentary, are set down in our catalogue under the title of the *Semiflosculosa*, to which order they belong. They are lactescent plants; and like the whole, or at least most part, of that kind, have a considerable acrimony in their juices. These here pointed out are indeed less acrid than most other lactescents; but even of these here mentioned, it is still the *Lactuca* or *Lettuce* that is most commonly employed, as having in the species of it employed the least of that acrimony that is peculiar to the order, and especially at the early period of its growth at which it is taken. In this state, it hardly discovers any thing sweet or mucilaginous in its juice; and therefore may be supposed to give little nourishment, especially in the raw state in which it is commonly taken; but when boiled, it proves more sweet and mucilaginous, and therefore may be supposed to go farther as a nutriment. Even in its raw state, as acescent and refrigerant, it is properly enough combined with animal food; but upon the same account in most persons it requires the condiments that are usually taken along with it.

Of the other *Semiflosculosa*, the *Succory* and *Endive*, especially the latter, make frequently a part of our food; but they are hardly ever taken while they contain their peculiar acid juices, and only when by the arts of blanching they are deprived of these. But even their blanched parts are left in possession of the juice in common to vegetables; which, as we have said above, is always of a fermentable nature, and therefore consists of a saccharine and nutritious matter.

I have to say the same things of the *Taraxacum*, or *Dandelion*. Whatever medical virtues in its natural state this may be possessed of, which for the reasons above I do not enquire after here, it can only be employed as a part of aliment when deprived of these medicinal qualities. It is in this state only as it first arises out of the earth, and more especially when its first shoots are become of some length, by their rising out of mole-hills or other loose earth.

After the *Semiflosculosa* which are chiefly employed in a blanched state, I have set down the *Umbellatæ*, for the sake of introducing a frequent article of diet, the *Celeri*. This is a portion of the *Apium graveolens sive palustre*; and what may be the medical or noxious qualities of this plant, it is not our business here to determine, as it is enough for our present purpose to say, that the *Celeri* is never employed as an alimentary matter but when it is deprived of its peculiar juices by being blanched: and in this state it is, on the footing of the other blanched plants, an alimentary matter sufficiently mild and perfectly safe. With respect to it,

however, in this state, it is to be remarked, that it is never so entirely deprived of its acrimony as not to retain more taste, and a more agreeable taste, than the other blanched plants; and upon this account it is more generally used at table. Although even in its blanched state, retaining a little acrimony, if it be very well boiled in water or broth, it becomes a tender mucilaginous, and therefore a nutritious, substance.

After the leaves and stalks of plants, I have inserted in my catalogue an alimentary matter, which, though it cannot be said to belong to the leaves or stalks of plants, is so much of an herbaceous nature, that it could not be properly mentioned in any other place. —This is the *Cynara*, which I have set down under the title of the botanical order of *Capitata*, because I believe there are some others of the same order which might be mentioned; but I mention only what I am acquainted with, the *Scolymus Cynara*, or Artichoke.

It is hardly necessary to say, that of this acrid plant the only alimentary part is the receptacle of the flower, and the portions of that which we pull away from it, in pulling away the separate squamæ of the calyx. The whole of this receptacle, even in its recent state, is of very little acrimony, and by being boiled in water is rendered perfectly mild. In its boiled state it is of a tender texture, somewhat sweet and mucilaginous, and therefore tolerably nourishing; but it is not remarkable for any other qualities that I can perceive; and its interrupting sleep, if ever happening, is certainly not constantly its effect.

After the alimentary leaves and stalks, and after the artichoke, which I consider as akin to these, I have set down in my catalogue what may be considered as a part of a stalk, that is, the first shoots or turiones of the *Asparagus*. There are some other plants, whose turiones, though they belong to acrid plants, are said to be mild and eatable, like those of the asparagus; but they do not appear to belong to any one order of plants, and I am not acquainted with the particulars.

The shoots of the asparagus, or at least a portion of their upper parts, when boiled in water, are very tender, somewhat sweet and mucilaginous, and therefore presumed to be considerably nourishing. When eaten in any quantity, they always soon after imbue the urine with a peculiar odour, which did not appear in the asparagus before it was taken into the body. This has given occasion to an opinion of the power of the asparagus, with respect to both the urine and urinary passages; but though frequently attending to the phenomenon mentioned, I have never found that at the same time the quantity of the urine was increased or its quality anywise changed.

Odours may arise from a very inconsiderable portion of matter, and give no certain proof of that matter's being in large quan-

tity present, or of its being very active, except in persons of peculiar idiosyncrasy. I am therefore disposed to be of opinion, that asparagus cannot commonly do either good or ill in the urinary passages. The instances given by *Schulzius* and *Bergius* of bloody urine, occasioned by eating asparagus, are certainly very unusual facts, and not to be applied to any extent: and if *Boerhaave* and *Van Sweiten* judged that upon some occasions they had observed the eating of asparagus to hasten on fits of the gout, I suspect some fallacy in their observation; for I have known many instances of a negative to it.

C. *Radices, Roots.*

The roots of plants commonly contain more nutritious matter than their leaves; and the experiments of *Mr. Parmentier* in his *Recherches sur les Vegetaux Nourissants*, show that a great number of roots never before thought of as esculent, do however contain a quantity of farinaceous matter, which may upon occasion afford an aliment. I shall not, however, take any particular notice of those that require such a preparation as he proposes and describes; because I believe the farinaceous, or, as he calls it, the Amylaceous, matter extracted from these roots, is exactly the same from whatever root it has been extracted, and the same that may be extracted from other substances with much less labour.—I am here, therefore to take notice only of those roots commonly employed as food in this country, in the state in which nature presents them to us, and hardly requiring any other preparation than the ordinary one of the kitchen.

Siliquosæ.

The two first marked are taken from this order: in all of which, as already observed, there is found a peculiar acrimony.

The *Raphanus* or Radish, has commonly a large quantity of alimentary substance, in proportion to its cortical part, in which only the peculiar acrimony of the order is lodged. It may therefore be eaten, as it commonly is, in its recent state, with the whole of its cortical part; and for which especially it seems to be taken, as it may rather serve as a condiment to its acescent substance, and which therefore seldom proves flatulent. It does not, however, seem to be very nourishing.

The *Rapum* or turnip affords a much larger quantity of mild pulp in proportion to its cortical part, in which only the peculiar acrimony of the order is lodged. As this cortical part can be entirely separated without much trouble, it is very generally the pulp only that is admitted into our diet. It is a watery and tender substance, and therefore is easily digested, and occasions little flatulency. It has some sweetness; but it does not seem to contain much nourishment in proportion to its bulk. *Margraaf* could not extract any sugar from it; and *Bergius* observes that it affords very little amylaceous matter. It is of two kinds, distinguished

by their colour of white and yellow. The latter we have become acquainted with in this country only of late. It is of a more sweet and mucilaginous taste, and therefore is seemingly more nutritious than the white. As it has also another property of being more hardy in sustaining the winter, it is likely to come into the most general use.

The botanists have given us two different species of roots under the titles of the *Brassica Napus* or *Naveu*, and the *Brassica Rapa* or *Turnip*; and both the gardeners and farmers are very well acquainted with the distinction; the former being most cultivated in France, and the latter more commonly in England. With what advantages the one or other may be preferred, I cannot clearly determine. But to me they seem to differ only in the form of the root; and I can find no difference in their qualities to be taken notice of here. Both the kinds are much employed in feeding cattle: and as they are given to them with the cortical part, it is alleged that they are ready to communicate an odour and taste of a disagreeable kind both to the flesh and milk of cows; but this does not seem to be constantly the case. And I think it is worth observing, though foreign to this place, that the milk of cows is not always affected by turnip; and perhaps only when some portion of the decayed leaves of the plant are given along with the root.

Umbellatæ.

Daucus. This is a root of very frequent use; and though it does not readily yield a grained sugar, yet it yields a great deal of sweet or melliginous juice, which gives a strong mark of its nutritious quality. In this root there seems to be a quantity of mucilaginous matter which prevents it from yielding a grained sugar; but at the same time undoubtedly contributes to its being nutritious. Experiments on brute animals show the Carrot to be nourishing in a considerable degree; and it is certainly so to man, affording a tender and not very flatulent food. The effects of these roots in poultice, and of the seeds of the plant as a medicine, will be considered in another place.

Pastimaca or Parsnips. Experiments on brutes show these roots to be considerably nourishing. They have a considerable sweetness in their taste; and they manifestly contain a great deal of mucilage; which, though it prevents their yielding much of a grained sugar, by no means detracts from their nutritious quality. A peculiar taste which remains in them even after boiling, is disagreeable to a great many persons. Whether this peculiar taste in the skirret and parsnip is accompanied with any diuretic quality, we will not positively determine; but we have not upon any occasion perceived it.

Sisarum. The roots of this plant in their recent state seem to be of a firm consistence; but by boiling in water they are brought to be very tender. *Mr. Margraaf* found them to yield a large propor-

tion of sugar: and Mr. *Bergius* found them to afford a quantity of amylaceous matter; and on account of both they are considerably nourishing and not very flatulent: but on account of a peculiar taste approaching to that of the parsnip, which remains in them even after boiling, they are not in such general use as might be expected.

With respect to these roots, the observation of Mr. *Bergius*, that their saccharine part does not go along with the amylaceous when this is separated, may deserve notice; as it may lead to some enquiries and speculations relative to the nutritive parts of vegetables.

Semiflosculosæ.

Of this order there are two alimentary roots, the *Scorzonera* and the *Tragopogon*, by the gardeners commonly called *Salsafi*. These roots resemble one another both in their alimentary and medicinal qualities as much as they do in their botanical characters. They are lactescent roots, but with a singular mildness in their juice which has a little sweetness; but neither by that nor by any other sensible quality do they give marks of their being very nourishing. When boiled, they are sufficiently tender, and do not prove very flatulent. Their medical virtues, if they have any, shall be taken notice of in another place. In the mean time, I must observe my being a little surprised at the otherwise judicious *Bergius* recommending the treatise of *Fehr de Scorzonera*, which appears to me to be a very frivolous work, and of no authority.

Alliaceæ.

Of this tribe we have a set of roots of much more activity than these last mentioned, and by that being of more importance as medicinal than as nutrimental.

Of these roots, the *Garlic*, *Roccambole* and *Shallot*, we suppose to be employed as condiments rather than as aliments. They indeed truly contain alimentary matter; and when the Garlic in certain climates is produced with less acrimony than it is with us, it may perhaps properly enough make a part of diet.

Of this order they are the *Porrum* and *Cepa* that are most commonly employed as alimentary matters, and afford indeed a large proportion of it. This appears especially in their boiled state, in which their acrimony is exhaled, and they show, with some sweetness a large proportion of mucilaginous matter. Even in their recent state, and especially when young, their acrimony is not so strong as to prevent our vulgar from taking them as a considerable part of their food. By our better sort of people, it is the onion only that is taken in its young and recent state, but hardly in larger quantity than may be considered as a condiment. Deprived, however, of their acrimony by boiling or roasting, they are used by all ranks more largely. It is, however, so difficult to deprive them entirely of all peculiar taste, that I have

known many persons who, from a particular idiosyncrasy, cannot bear them even in a boiled state.

The acrimony of the Alliaceæ is very nearly of the same nature with that of the Tetradinamia, and they have therefore the same diuretic quality: but this, with respect to both orders, is to be considered in another place.

To the list of roots, I have here added the *Batatas* or potatoes, or the roots of the *Solanum Tuberosum*, now become in almost every country of Europe, and especially in our own, an important article of diet. I shall, however, consider this root as entirely a farinaceous matter; and as it may be proper in the first place to consider these farinaceous matters in general, I shall afterwards take up the consideration of particulars, and among the rest that of the Potatoes and others.

D. *Semina, or the Seeds of Plants.*

These are in general and chiefly nutritious, as containing a farina or farinaceous matter; and as such they make the most considerable part of the aliment of men over almost the whole of the earth. This has led *Dr. Haller* to introduce the term of *Farina Alibilis*, and to mark it as the chief part of our vegetable aliment. To avoid, however, the inaccurate idea that might arise from this, we have taken some pains above to show that farina, or that powdery substance which is found in nutritious seeds, is a compound matter, consisting chiefly of sugar and oil. These, indeed, are often so blended together into what may be called a neutral substance, that the properties distinguishing the two ingredients can hardly, or at least, rarely, be perceived in the compound. Although it is not in our power to explain in what manner the vegetable æconomy forms the various compounds it produces, nor to account for the appearances these productions put on, yet we judge it to be shown above, that the compound we name Farina is truly such as we here suppose it; and that by marking the appearances or experiments which show more or less of the saccharine or oily matter in the several seeds, we may in some measure ascertain their several qualities. Upon this plan we now proceed to treat of particulars.

We refer the several farinacea to three different heads, under the titles of *Cerealìa*, *Legumina*, and *Nuces Oleosæ*; which though not quite exact, is sufficiently so with regard to the most part of them. By this assortment, we think they may be distinguished as they contain more or less of saccharine and oily matter, or as they are in proportion to one another. In the *Cerealìa*, we suppose the sugar to be large in proportion to the oil; in the *Legumina*, the oil to be somewhat larger in proportion to the sugar; and in the *Nuces Oleosæ*, the proportion of the oil to be still greater. At the same time we believe it will be found, that in the several farinaceous seeds the nourishment they afford is in proportion to the oil they contain.

a. *Cerealia*. Under this title are commonly put the seeds of the several gramineous or culmiferous plants that are employed as the food of men. It is, we believe, justly supposed, that the seeds of the whole of this order contain a farinaceous matter of a similar nature, and that our choosing those to be here enumerated is merely from the size of their product, which allows them to be more easily collected in considerable quantity, or perhaps from their being more easily cultivated in certain soils and climates. This in the main may be just; but there is some difference in the qualities of the *Cerealia* here enumerated, which we must now take notice of.

Hordeum, Barley.

In the species of this there is some difference, according to the number of seeds in each row of the ears; and hence the *Hordeum Distichum*, *Tetrastichum*, and *Hexastichum*: and this difference is attended with some difference in the size and plumpness of the grain, but with no difference of qualities that we can perceive.

We have observed above, that all the *Cerealia* by their germination have their saccharine matter evolved, and therefore more readily subjected to a vinous fermentation. This seems to take place more readily, perhaps more fully, in barley than in any other of the *Cerealia*; and therefore it is the grain from whence very universally our Beers and Ales are prepared. Whether barley actually contains a greater proportion of saccharine matter than the other *Cerealia*, or merely differs from them by that matter's being more readily evolved, we dare not determine: but from the circumstance of its ready evolution, it appears probable, that the barley contains in its farina a smaller proportion of oil than some other grains, and upon that account is less nourishing than those others. This is confirmed by the experience of our vulgar, who sometimes live on barley, and sometimes upon oats. In some higher parts of this country where they raise much barley, and therefore live more upon it, it is common for them to purchase a quantity of pease to mix with their barley, in order to render their bread and other food more nourishing. The same is confirmed by experiments on brutes, who are not found to be nourished equally by the same quantity of barley as of oats.

Barley is employed as a part of diet both in its unmalted and in its malted state. In the former, however, almost only, it is employed as a common aliment; and I do not know that there is any experiment or observation which shows that barley in its unmalted state is a more antiseptic aliment than any other grain. Of late, however, we have learned, that in its malted state, its saccharine matter, extracted by infusion in water, and given as a part of diet, proves remarkably antiseptic. I have no doubt that this is to be imputed to its acescent quality as a saccharine matter. It is long

ago since I pointed out sugar as an alimentary matter, and as being fitted for obviating the putrefactive tendency of the animal fluids; and it was from this hint that *Dr. Macbride*, as he himself informed me, first proposed the employment of wort for preventing the scurvy. I am still persuaded that a plain sugar may be employed for this purpose; but I shall hereafter observe, that sugar cannot be employed alone in large quantity with the same safety as when it is accompanied with some farinaceous or oily matter, which renders it more ready and proper to enter into the composition of the animal fluid.

A decoction of barley, or, as it is called, barley-water, is a drink employed in many diseases; and it is not unworthy the attention of the physician to direct the proper preparation of it. Accordingly the London and Edinburgh colleges have both given their directions for this purpose. The particular scope of their directions is, that as the decorticated, or as it is called pearl barley, is by long keeping liable to get a mealiness upon its surface, which is ready to become musty, the barley should by repeated ablutions, be well freed from the mealy part on its surface before it is subjected to decoction.

Secale, Rye.

How this grain turns out in making, I have not had an opportunity of learning, as the culture and employment of it is rare in this country; but as in the northern countries of the continent it is frequently employed for affording an ardent spirit, there can be no doubt of its containing a due portion of sugar. By the large quantity of mucilage, three-fourths of its weight, that it affords by decoction in water, it may be presumed to be sufficiently nourishing. But its not affording any milkiness to water triturated with it, shows that its oil is under a peculiar combination: and if there be a due portion of oil in it, it is difficult to explain why this grain, of all the other Cerealia, should be the most readily acescent. This indeed might seem to detract from its nourishing quality; but the experience of the northern countries of the continent sufficiently establishes it. It is little employed as an aliment with us: and the people unaccustomed to it, upon occasionally taking it, generally find it laxative; which is readily explained by its acescency.

With respect to the nature and effects of the *Secale Cornutum*, I must leave it to be determined by the study of many late writers upon the subject. Rye is so little cultivated in this country that I have had no proper opportunity of examining the matter myself; and can only say, that though there are several people of this country who take rye pretty constantly as a part of their diet, I have never known or heard of any peculiar disease arising among them.

Milium, Millet.

This is so little used in this country, that I have had little op-

portunity of judging of its qualities. It has some sweetness, but does not discover much acescency, and seems to be easily digested. That this or any other of the Cerealia binds the belly, I will not believe upon the authority of *Hippocrates* himself.

Oryza, Rice.

This is a grain which has long been the farinaceous ailment of the greatest part of Asia, and has now for a long time been employed as an aliment in Europe; but its peculiar qualities are not easily ascertained. It has little sweetness, is not readily acescent, nor readily subjected to fermentation. From these circumstances, and as at the same time it is by the testimony of all Asia sufficiently nourishing, we would judge that its oil, though very intimately united with its saccharine part, is, however, in good proportion; and I would judge it to be more nourishing than any of the grains already mentioned. Upon what grounds *Spielmann* supposes it to be less nourishing than barley or rye, I cannot perceive. Its nutritious matter is not attended with any noxious quality that I can discern; and therefore the notion that has sometimes prevailed in this country, of its being hurtful to the eyes, seems to be without foundation. It has been supposed among physicians to be possessed of some drying or astringent quality; and has therefore been commonly employed in diarrhœa and dysentery preferable to other farinacea. But this opinion also I take to be groundless: for it does not give any mark of astringent quality with the vitriol of iron; and if it has ever been found useful in diarrhœa, it must, as *Spielmann* properly judges, be owing entirely to its demulcent power; which, however, is not stronger in it than in several others of the farinacea.

Avena, Oats.

This is a farinaceous food used by many people in the northern parts of Europe: but it is especially the food of the people of Scotland, and was formerly that of the northern parts of England; countries which have always produced as healthy and as vigorous a race of men as any in Europe.

The meal of this grain discovers little sweetness; and rather when a little toasted gives what we call a kernel taste, approaching to that of the *nucis oleosæ*. In its sound state it is entirely without any bitterness; which *Spielmann* and some other writers have alleged to be in the bread made of it. It discovers no more acescency than the other farinacea; and when malted is readily subjected to fermentation, and affords an ale which, though seldom made very strong, is very agreeable and without any bitterness. The nourishing quality of oats, both with respect to men and brutes, is in this country very well known; and I use the same reasoning with respect to its saccharine and oily parts, as I did above with respect to Rice. With respect to it, physicians and the vulgar have fallen into contrary opinions; but both of them, as I judge, mistaken. The former, especially the French, speak of it

as refrigerant: but it is merely so as being a vegetable aliment not heating. The vulgar, and especially the great vulgar of England, from its being ready to give some heartburn, or sense of heat at stomach, have supposed it to be heating; and from a mistake with regard to the state of diseases, have supposed it to give cutaneous affections, not more frequent in Scotland than in other countries; and which indeed arise from no particular aliment, but always from a contagion communicated from one person to another. With respect to the heat perceived at the stomach, it is owing to the acescency which oaten bread, commonly unfermented, is liable to occasion; and I have frequently found, that unfermented bread of wheat meal was equally liable to give the same heartburn and sense of heat at stomach. Where a decoction of oatmeal, or water-gruel, is in request, I think it proper to mention here in what manner it may be rendered most agreeable. An ounce of oatmeal is sufficient to make two quarts of water-gruel. The meal is to be put into three quarts of soft cold water, and set over the fire. The meal is to be constantly stirred among the water till it boils; and then it is to be allowed to boil till a third of the water is boiled away. The decoction is then to be poured through a linen cloth into a bowl a little larger than sufficient to contain it. In this bowl it is to be left to cool: and when cooled it will be found to separate into two parts, one of them a mealy cloud or sediment, and the other a very thin and clear liquor. The latter is to be carefully decanted or poured off for use. To render this more agreeable by the addition of sugar, acids, or aromatics, or to impregnate it with medicinal substances, I leave to the judgment of the nurse or of the physician.

Zea, Maize.

This is entirely an American grain, affording a farina of the best quality, and largely nourishing both to men and brutes, as the experience of America has fully ascertained. The ripe seeds are of a hard substance, but may be broke down into a very fine meal. This has little sweetness, and no acidity that I can perceive. By itself, and even with yeast, it does not ferment so well as to give a light bread; but added in pretty large proportion to wheat meal, it may be made into a very perfect bread.

Triticum. Wheat.

This is the farinaceous food most generally used by the better sort of people over the whole of Europe, excepting the very northern parts in which it cannot be produced; but even there it is imported for the use of persons of condition. It has this advantage, that it can be formed into a more perfect kind of bread than any other of the Cerealia that we know of; and before going further, it seems proper to take this opportunity of saying something of bread in general.

When food is taken into the mouth, it is often necessarily de-

tained there, in order to be subjected to a proper manducation; and even when it is of so soft a kind as not to require that, it certainly conduces to digestion that such food be detained in the mouth till it is divided into small parts, and at the same time intimately mixed with the saliva. For this purpose of detaining food till it is subjected to a due manducation, it will be evident that no measure can be more proper than the taking in along with our different foods a quantity of dry, friable, and nearly insipid matter. Such a matter is bread, in itself also nutritive: and we might say more with respect to the propriety of its use; but it is enough to remark in proof of its being particularly suited to the purposes of the human œconomy, that, very universally, mankind are impressed with an instinct to employ it. While the farinacea are distributed so universally over the face of the earth, and have become the chief objects of culture, they are very generally made into bread; and as generally a portion of them is taken into the mouth along with almost every morsel of other foods. That this is a general instinct, and suited to the purpose of the human œconomy, is well illustrated by this, that the Laplanders, in want of the vegetable farinacea, make a powder of fish-bones, and employ it made into a bread. This is the general idea of the purpose of bread, which is very universally made of vegetable farina. But as it would be inconvenient to employ this in its powdery state, so it is brought into a coherent mass by water, and this again is brought into a dry and friable state by a proper application of heat, or what we call baking; and by all this rendered fitter to be divided and taken in separate morsels.

Bread may be prepared of any of the farinaceous substances already mentioned; but in many cases the bread so prepared is less dry and friable, less miscible therefore with the saliva and with our other foods, and perhaps less wholesome than might be desired. Mankind, therefore, have studied and found out a means of correcting these faults and imperfections of the bread made of meal and water alone; and this they have found to be by subjecting the paste of meal and water to a certain degree of acescent fermentation before it is again dried or baked into a bread. Under this fermentation it is found, that the mealy paste has a large quantity of air extricated, probably exhaled; but as a quantity of it remains still diffused, the mass is swelled into a large bulk, and when the heat is applied, the bread formed is of a more spongy texture, more tender, friable, and more readily miscible with the saliva and with our other foods.

These qualities give the most perfect bread: but the most complete fermentation cannot be given with equal success to every kind of farina. Most of the kinds hitherto mentioned made into a moist paste, and kept in a warm place, will enter into some aces-

cent fermentation: and this fermented portion added to another quantity of the same paste, will communicate some fermentation to the whole, which when baked, will give a bread of a lighter kind than could have been formed of unfermented paste. In some other cases also, where the fermentation of the paste alone does not succeed so well as might be desired, it may be assisted by an addition of yeast, or lees of ale; but even this does not give with any of the farinacea, excepting wheat, a very perfect bread. It is therefore with wheat meal only, without any foreign ferment, and by its spontaneous fermentation alone, that the most perfect bread can be obtained. That this is the peculiar property of wheat appears from hence, that even those farinacea which by themselves cannot by any art be brought to afford a perfect bread, yet, by being joined with a certain proportion of wheat, may along with this be brought into the state of perfect bread.

This peculiar property of wheat was observed very long ago; but the cause of it was not perceived, whilst wheat seemed almost in every respect to possess only the qualities in common to most of the other farinacea. It was about the year 1728 that *Beccaria* of Bologna discovered something in the constitution of wheat very different from what he could discover in any other of the farinacea. This is a glutinous matter which remains after the amylaceous part is washed off; and which has the properties of animal substances, very different from the properties of the other part of the wheat, and from those of any other vegetable farina yet known. This discovery has been since confirmed in every respect by many other philosophers and chemists of Europe; and it is now published in so many writings, and so commonly known, that it does not seem necessary to enter into any further detail concerning it here. We have introduced the mention of it chiefly to say, that it is probably this part in the constitution of wheat that renders it fitter for a spontaneous fermentation, and by perhaps a peculiar mode of fermentation, to form wheat into a more perfect bread than can be made of any other farinaceous substance taken entirely by itself. That this is the effect of the glutinous part of wheat, appears very probable from hence, that by the addition of a portion of this glutinous part of wheat to other farinacea, they can be brought into a more perfect bread than they could by any means be brought to without such addition.

We have thus explained the peculiar property of wheat in being fit to give a more perfect bread than any other farinaceous substance; but wherein it otherwise differs from these, we dare not determine. Since the discovery of *Beccaria*, most physiologists, except *Mr. Parmentier*, have been of opinion, that on account of its containing a matter approaching to the nature of animal substance, it should afford to animals a greater quantity of nourish-

ment than an equal weight of these which do not contain any such matter. This, however, is not quite certain: for though by the operations of *Beccaria*, a glutinous matter cannot be separated from the other farinacea in the same manner as from wheat, in which, even in the grain, it seems to lie separate from the other substance of it; yet it may, notwithstanding, be present in the other farinacea in a more diffused, and therefore more inseparable state. The coagulable nature of the other farinacea by heat, as a property belonging to animal substances, gives some presumption of their containing something of this kind; and it does not appear certain that wheat gives more nourishment to men, or other animals, than some other of the farinacea do. In short, till experiments shall have determined this, we are disposed to conclude, that the property of wheat, which has rendered it so generally employed and preferred, is merely its superior fitness for affording a more perfect bread.

While we are upon this subject of bread, it seems very proper to enter upon the discussion of an opinion which in modern times has very much affected our reasonings concerning the qualities of the farinacea employed in diet. The discovery of the circulation of the blood naturally led physicians to consider obstruction as a principal cause of disease; and while they were ignorant of, or inattentive to, the other possible causes of obstruction, they were ready to suppose a certain state of the fluids to be the chief cause of it. This gave occasion to the Cartesians to introduce the doctrine of a *lensor*; and which, from the application of it we have now mentioned, has prevailed in our pathology ever since. We are not here to consider whether it be well or ill founded; and are only to take notice of a mistake which it has occasioned with respect to the use of farinaceous matters in diet. *Dr. Boerhaave* having given the *glutinosum pingue* as one of the simple diseases of the fluids, has assigned as the first cause of this, the use of the *farinosa non fermentata*: and his learned commentator has taken up the opinion, and repeated it, though not always with consistency, in many parts of his work. In entering upon the consideration of this, we are willing to own that a farinaceous substance formed by fermentation into a perfect bread, is the most wholesome condition in which farinaceous matters can be employed as a part of our food; and we are also ready to allow that the unfermented farinacea taken in immoderate quantity, especially at a certain period of life, or in dyspeptic stomachs may be the cause of disease: but all this seems to have been exaggerated; for the morbid effects of unfermented farinacea are truly rare occurrences; and indeed the same unfermented farinacea are for the most part very well suited to the human œconomy.

However considerable the use of fermented bread may be, the use of unfermented farinacea is still very great and considerable

amongst almost every people of the earth. The whole people of Asia live upon unfermented Rice; and I believe the aboriginal Americans, before they became acquainted with the Europeans, employed, and for the most part still employ, their Maize in the same condition. Even in Europe, the employment of unfermented bread, and of unfermented farinacea in other shapes, is still very considerable; and we are ready to maintain, that the morbid consequences of such diet are very seldom to be observed. In Scotland, nine-tenths of the lower class of people, and that is the greater part of the whole, live upon unfermented bread, and unfermented farinacea in other forms; and at the same time I am of opinion, that there are not a more healthy people any where to be found. In the course of fifty years that I have practised physic amongst them, I have had occasion to know this; and hardly have met with a disease of any consequence that I could impute to the use of unfermented farinacea.

Physicians who represent these as a noxious matter, must at the same time acknowledge, that in every country of Europe it is often used with perfect impunity. To obviate, however, the conclusion I would draw from this fact, they allege, that it is only safe when used by robust and labouring people; but we give it in this country, not only to the farmers' labouring servants, but to our sedentary tradesmen, to our women, and to our children; and all of the latter live and grow up in good health, except a very few dyspeptics who are not free from complaints, which those also are liable to who live on fermented wheaten bread. What may happen to children who from their birth are fed with pap instead of mother's milk, I cannot determine, because I have not had occasion to observe such a practice. In this country, our children have hardly any other food except their mother's milk for the first five months of their life; but after that period, or perhaps sooner, oatmeal pottage, with cow's milk, is gradually introduced as a part of their diet. After their being weaned they are put upon this very entirely: and the bad consequences of it at either period we have never perceived.

From all these considerations, it will appear that a great deal too much has been said of the noxious effects of unfermented farinacea. I have said above, that it would surprise modern physicians to find that *Celsus* (who like other ancients can hardly be in the wrong) should say, that unfermented was more wholesome than fermented bread. I am ready to allow that he was in the wrong: but I am disposed to suspect that it happened from his observing that the lower people, who lived on the unfermented, were generally more healthy than those of the better sort, who lived upon fermented bread.

We have thus offered some reflections on the several Cerealia, strictly so called, that are used in this country; and must now say a little of several farinaceous substances which are not of the

tribe of Gramina, but very much of the same farinaceous nature with these.

Fagopyrum, Buckwheat.

This is so little used as an aliment in this country that I have hardly had any opportunity of studying its effects; but from all appearances, it has the common quality of a farina. The common employment of it by the weaver shows its mucilaginous nature; and in feeding poultry it appears to be considerably nourishing.

Sago, or Sagu.

This in our catalogue we have referred to the *Cycas circinalis*; but whether properly or not seems uncertain: and it is not necessary for us to determine the matter more exactly here, as we believe it is obtained from different trees, which though somewhat different, afford one and the same kind of substance, such as we have it imported under the name of Sago.

It comes to us in a granulated form of a farinaceous matter, which by being boiled in water is resolved into an insipid almost transparent jelly. Its gelatinous state points it out as a nutrient matter: and we are assured that it is much employed as such in the East Indies, and that in some parts of that country it makes a great part of the food of the inhabitants. The value which the Japanese put upon it appears strongly from the account given of it by *Thunberg* in his *Flora Japonica*, under the article of *Cyvas revoluta*.—"Drupæ comeduntur a Japonensibus; medulla autem caudicis, supra modum nutriens, imprimis magni æstimatur; asseverant enim, quod tempore belli frustulo parvo vitam diu protrahere possunt milites; ideoque ne commodò eodem fruatur hostis extraneus, sub capitis pœna vetitum est, palmam e regno Japonico educere."

We have no experiment to determine the proportion of nourishment which it affords in Europe; but must think it considerable: and as a matter readily soluble, it is properly in this country given as an aliment to weakly persons.

Salep, or the Root of the Orchis Morio.

The preparation of this root, by which it is brought into the state of a farinaceous powder is now well known. As brought to us from Turkey, it is supposed to be formed from that species of the *Orchis* above set down; but from *Mr. Moulton's* account in the *Philosophical Transactions*, vol. lix. it may be formed from several other species of the same genus; and I have seen it prepared in this country from the *Orchis bifolia*, as pure and perfect as any that comes from Turkey. In either case it is an insipid substance, of which a small quantity by a proper management converts a large portion of water into a jelly. This gelatinous quality presumes it to be nutrient; but we know of no experiments that have ascertained the degree of its nutritious quality, and we judge it to have been greatly over-rated.

The demulcent qualities both of this and of the preceding article will be considered hereafter.

It is now proper for me to consider another farinaceous root, as I promised to do after considering the other farinacea. This is the *Potatoe*, or Roots of the *Solanum Tuberosum*. This root, by a proper drying, is readily brought into a farinaceous powder that has every property of the *Cerealia*, except that it affords no gluten or animal matter, as wheat does. It affords a large proportion of an *amylum*, precisely of the same nature with that of wheat, or of any other of the *Cerealia*. Its nutritious quality in general is now ascertained by the experience of all Europe; as in almost every part of this it makes a considerable portion of the food of the vulgar. As, however, potatoes contain such a considerable proportion of water, amounting to one half or more of the whole weight, they cannot be supposed to give, in proportion to their bulk, so much nourishment as the *Cerealia* do. In compensation, however, of this, their watery texture renders them of easy solution and digestion in the stomach; and I think they are less liable to become acescent or to give heart-burn than the unfermented *Cerealia*.

Whilst the Potatoes are nourishing, as we have said, they are without any noxious quality that I can perceive; and I am surprised to find it has cost *Mr. Parmentier* so much trouble to engage many of the philosophers of his country to approve of the use of this root, while the vulgar, by the sure guide of experience, are universally reconciled to it. To confirm this I do not think it necessary to employ any other chemistry than what is mentioned above.

As the people of this country do not put so much value on fermented bread as those of some other countries do, so we have hardly thought of making Potatoes into a fermented bread. But with the vulgar they frequently answer the general purpose of bread taken in their boiled state, in which they are often found to be dry and mealy.

The other modes of cookery proper for introducing this root into diet, are now sufficiently known; and whoever would enquire more curiously into this may consult *Parmentier* and *Bergius*.

Castanea, the *Chesnut*.

As this fruit affords no oil by expression, I could not as I had formerly done, insert this article among the *Nuces Oleosæ*, and have been a little uncertain where to place it; but I can find no place more proper for it than here, after the *Cerealia* and other farinaceous matters which resemble these.

The chesnut has a good deal of sweetness, which is more evolved by heat applied; and its saccharine nature is sufficiently evident from the fermentable nature of its juice. Though it gives no oil by expression, yet from the oil that is manifest in the

o the *Fagus Sylvatica*, it may be supposed to be in this also, although it happens to be more intimately united with the saccharine part. Both together form a farinaceous matter which can be made into bread, and treated in every manner that the other farinacea can be. Its nutritious qualities are well known to the people in the southern parts of Europe, amongst many of whom it is often the chief and almost the whole of their food. It is said to be of difficult solution and digestion; and from the firmness of its texture, this might be suspected: but as said above, this quality is more frequently suspected to be hurtful than it ought to be.

b. *Legumina, Legumes or Pulse.*

These terms have not been accurately applied; but we would strictly confine them to the fruits of the papilionaceous plants; to the capsule of which, of a determined structure, the botanists have now affixed the term of *Legumen*.

In entering upon this subject, we cannot help beginning with an observation, which, though seemingly not connected with our treatise of materia medica, is not altogether foreign to it. It is this, that the seeds of the legumina are a farinaceous substance, affording an alimentary matter, upon the same principle as the *cereal*ia and *farinacea* in general do: and these two substances, the *cereal*ia and *legumina*, make the greatest part of the vegetable aliment employed by men. They are therefore very universally the objects of the farmer's culture: and it is agreeable to observe how well these two orders of plants, the *Culmiferæ* and *Papilionaceæ* are particularly adapted to that purpose. Whilst the *culmiferæ*, raised upon the same soil for several years successively, exhaust and render it barren, so that without rest or manure, its fertility cannot be maintained; but if instead of repeating upon the same soil the crops of the *culmiferæ*, these crops are alternated with crops of the *papilionaceæ*, the fertility of the soil may be preserved without rest or manure for many years together. This I know from experience; and it shows how well these two objects of the farmer's culture are adapted to his purpose; and that, while farinaceous matters in general are the alimentary substances required, nature has given them of two different kinds, to favour the cultivation of both.

This observation, though of the utmost importance, is not always properly observed by the farmer; but it was very anciently perceived, and in general observed.

Hence VIRGIL:

Aut ibi flava seres mutato semine farra;
Unde prius lætum siliqua quassante legumen;
Aut tenues fœtus viciæ, tristisque lupini
Sustuleris fragiles calamos, sylvamque sonantem.

The other ancient writers on husbandry always mention the leguminous crops as answering the purpose of manure; and the

moderns have properly named them *Meliorating Crops*. The reason of all this might be given, but it is not proper in this place.

The seeds of the *legumina*, when quite ripe and dry, are readily broke down into a fine powder, in its consistence resembling the *farina* of the *cerealia*, but of a more unctuous softness, and of a sweeter taste. When triturated with water, they give a more milky solution than the *cerealia*; and when the entire seeds are treated by expression, with a considerable heat applied, they give manifestly an oily exudation. In their germination they show a considerable quantity of a saccharine matter evolved; and in this state their solution is readily enough subjected to a vinous fermentation. Their resembling the *cerealia* is further evinced by their affording, in consequence of a proper treatment, a considerable quantity of *amylum*. All these considerations show that the *legumina* contain a saccharine matter equal to that of the *cerealia*, and at the same time a greater proportion of oil; which explains sufficiently why the former are more nourishing than the latter. This is confirmed by daily experience in brutes; and that it is the same in men I am assured from this observation: On certain farms of this country, upon which the *legumina* are produced in great abundance, the labouring servants are much fed upon that kind of grain; but if such servants are removed to a farm upon which the *legumina* are not in such plenty, and therefore they are fed with the *cerealia*, they soon find a decay of strength; and it is common for servants in making such removals to insist on their being provided daily or weekly with a certain quantity of the *leguminous* meal.

It is perhaps owing to the *leguminous* seeds being of a more oily quality, that they are not of so easy solution as the *Cerealia*, and are therefore suited to the more robust people. They have also another quality which very much affects the digestion of them. By the experiments of *Boyle* and *Hales*, it appears that they contain a large quantity of air in a fixed state, which during their digestion in the stomach is extricated in greater quantity than can be again absorbed: and upon that account these *legumina* have been at all times noted for occasioning flatulency, and sometimes colic pains.

It is to be remarked, that the *legumina* are used in two different states: one is when they are young, and therefore of a tender texture, easily digested, and giving less flatulency, but at the same time giving less nourishment: the other state is, when they are ripe; in which state they are more nourishing, but with the qualities of being difficultly digested, and of occasioning flatulency, as we have said. Their qualities in the various intermediate states may be judged of as they approach more or less to the one or other extreme.

After saying thus much of the *legumina* in general, I need say little about the particulars.

Pisum, Pease.

Faba, the Bean.

The difference of these, with respect to the general qualities mentioned above, is very inconsiderable. The pease, though perhaps less nutrient and less flatulent than the bean, are generally more tender; and therefore it is that the pease, in their full grown state, are more frequently, and almost only, upon our tables. With respect to their young state, the same difference may appear; but I believe it is for the following reason, that the pease can be more conveniently employed in a younger state than the bean. The husk of young pease is a tender and soluble substance, and is never separated from the fleshy part of the pea; whereas the husk of the bean is not such a soluble matter, and is therefore commonly and very properly separated from the body of the bean, especially when this is in any thing of an advanced state.

With respect to both these legumina in their young state, there is a considerable variety of them both for the purpose of the gardener and of the table; but the difference of their qualities for the latter purpose is not considerable, and may be easily ascertained by the circumstances to be perceived in the taste of them, as they are sweeter or more mucilaginous.

Phaseoli, Kidney-Bean.

These in their ripe state cannot be easily produced in this climate, and therefore seldom appear upon our tables. They are said, and seem to me, to be less nutrient and less flatulent than the pease and beans. The *Phaseolus* in this country is only employed in the young and green state of their *Legumina*; and some species of pease may be employed in the same manner. In both cases, the substance when well boiled is of the oleaceous kind: but though sweeter and more nutrient than these, is still tender and easily digested.

c. Nuces Oleosæ.

These are farinaceous seeds, which have a large proportion of oil in their composition. We have said above, that oil is always a part in the composition of farina. But in many instances it is so intimately united with the saccharine part, that its distinguishing qualities do not appear. Here, however, it does appear, or at least it is very readily by expression or heat separated in its proper form.

In what manner it before existed in the seed, is not very clear. The common opinion is, that even in the seed it existed in a separate state, lodged in certain cells separate from the rest of the substance: but this is not certain; for the eye, even assisted with the microscope, does not discover such cells; and in certain seeds treated by infusion, the whole of their substance is extracted in the form of a mucilage, in which no oil appears separated. The oil here, therefore, in this mucilage, is united with the other parts

of the substance, and may have been so while it existed in the entire seed. How indeed, in that case, it can be separated by expression, is not easily explained; but from the considerations just now offered, it must somehow be done without leading us to suppose the separate existence of it in the seed.

This subject is touched as a piece of chemistry relative to some questions that have before occurred; but it is not necessary to insist farther upon it now: for whether the oil of the *Nuces Oleosæ* exists in a farinaceous or in an oily state, it will equally answer our purpose in proving, that these kernels are considerably nutritious; and that bulk for bulk, or weight for weight, they are more so than any of the farinacea hitherto mentioned. They are accordingly employed in diet; and in some instances as a considerable part of it. This indeed happens in a few instances only, and chiefly when they are taken in their young and unripe state; for it appears that as they proceed in their growth, it is their saccharine and strictly farinaceous matter that is first produced with a smaller proportion of oil; and that by the further maturation of the seed, the quantity and proportion of the oil is constantly increasing to the utmost it can arrive at. It is thus we may explain the large use that is made of the cocoa-nut or chocolate in the torrid zone.

In other cases, where the oil of these kernels is in large proportion to the other substance, I doubt if they can be employed as food in large quantity, and by themselves, for that purpose. Whatever may be the power of our gastric fluid, I believe it does not operate upon any vegetable substance, unless this substance is at the same time subjected to some degree of fermentation; but oily matters seem to resist this, and are therefore of difficult digestion, lie long in the stomach, and often feel uneasy there. It is true, that oil itself is digested; but it probably is by a mixture with acids previously provided in the stomach, and when at the same time both the oil and acid are in a fluid state. In the case of the oily farinacea, it seems to be the solution that gives the difficulty; and I have known many instances of parts of these kernels being brought up from the stomach by a rumination, long after they had been taken down.

Enough is now said with regard to the nature of the oily farinacea in general; and the particulars do not give occasion for much to be said.

The *Avellana*, the *Amygdalæ dulces*, and the *Juglans*, do each of them contain a large, and much the same, proportion of a mild oil, and are therefore very much of the same nature and qualities, whether as food or medicine. It is only to be remarked, that as we said before that these oily kernels are in different states in the progress of their maturation, so they will also differ according to their climate, giving more or less of that maturity. Thus the Filberts or hazel-nuts of this climate do not contain

the same quantity of oil which they do in more southern regions. —These three oily nuts mentioned have each of them a cuticle inclosing their farinaceous and oily matter. This, in the two first, is a powdery astringent substance; and when the kernels are eaten with the cuticle upon them, this adheres to the fauces for a long time after, and excites coughing; which, however, does not at all happen from eating the decorticated seeds.

The *Pistachio* does not contain such a quantity of oil as the others mentioned; and how it turns out in nourishment I have not learned.

One of the most considerable of the oily farinacea, is the *Cacao* or Chocolate, which yet remains to be spoken of. How it may differ in its farinaceous part from that matter in the other seeds, I cannot perceive: but it seems to be very intimately blended with the oily part, as it exists in the nut or kernel; and it seems also particularly fit for being united by triture with that oil when it has been anywise before separated. With this farina the oil seems to be in as large proportion as in any other of the oily farinacea; and this oil, while it is equally bland as in any of the others, has this superior quality, that it is much less liable than any of them to become rancid.

From these circumstances it will appear, that chocolate must be equally nutritious with any other such substance, and perhaps less offensive to the stomach. This substance, however, is not always easily digested, and has sometimes given all the inconveniencies in digestion that have happened from the others. But it appears that these inconveniencies may be in a great measure obviated by a very diligent triture, uniting very intimately the farinaceous and oily part. This seems to be attempted in every preparation of Chocolate for food: but it seems to be no where executed so perfectly as at London; where, instead of the levigation formerly practised, it is made to pass between two cylinders rolled against one another. The Chocolate thus prepared can be very equally diffused, and almost dissolved, in water or milk, and that without showing any particles of oil floating separately on the surface; which, however, happens to every other preparation of it that I have seen. It is at the same time to be remarked, that Chocolate is always more easily digested, as its oily and farinaceous parts are, by its preparation, more intimately united together.

To the list of the *Nuces Oleosæ* should have been added the *Semina Papaveris Albi*, or White Poppy Seeds, which, with a portion of farinaceous, contain a large quantity of oily matter, which may be copiously obtained from them by expression. This has precisely the same qualities as the other expressed oils, and has been employed both in diet and medicine as the others have been. It is hardly necessary at present to say that these seeds have not in the slightest degree any part of the narcotic quality which pre-

vails so considerably in the capsules, or as they are called the Poppy-heads, from which they are taken. These seeds have been employed in diet in considerable quantities, without discovering the smallest degree of a narcotic quality, or any other than those of the *Nuces Oleosæ* we have already treated of.

To the same list of oily seeds might have been added the seeds of the cucurbitaceous fruits, commonly known under the title of the greater Cold Seeds. All these, with a portion of farinaceous matter, contain a quantity of oil, which gives them a title to be mentioned in this place. They have accordingly been formerly much employed along with almonds in preparing emulsions. There is no impropriety in their employment; but at the same time they have no different qualities from those of the almond, and have certainly no peculiar refrigerant powers to recommend their use. They are therefore now properly omitted in both the Edinburgh and London dispensatories.

The oily part of these oily farinacea separated by itself is much of the same nature in all the different species, and is much of the nature of the Olive-oil, which is next to be spoken of; and which, as an oil, is more employed in food than all the rest.

Oil of Olives.

Much might be said of this as a medicine; but I am here confined to speak of it as a nutriment only: and if we consider how much oily matter is necessary to the animal system, it will readily appear why so much of oily matter is taken in diet. Besides the quantity of oily matter that is almost always joined and intermixed with our animal food, there is even a part of that, and a very great part of our vegetable aliments, that in our cookery are almost constantly accompanied with oil in one shape or other; and there are hardly any people known that do not make use of oil in its separate state, and who have not made some provision for this purpose. This provision is indeed drawn from different sources in different countries; but it seems to be very nearly of the same nature in all of them: that is, it is a mild and bland oil, with little odour or taste, and very nearly the same as it is found in many vegetables, and in the bodies of almost all animals. At least these oils, when brought to the same degree of purity, are, except in point of consistence, very nearly the same. There will be no difficulty, therefore, in admitting that the unctuous and mild oils of vegetables are suited to supply the human body, either as it grows requiring nourishment, or as upon occasion of waste it may require repair.

As the oil of the human body is collected for the purposes of the æconomy in considerable quantities in particular parts of the body; so it may be, and has been, imagined, that the oil taken into the body is merely to afford or supply the oil of the adipose membrane; and that, as taken in, it continues unchanged both as it passes through the first passages, and even as diffused in the

blood-vessels it continues there unmixed till it exudes through pores in the vessels into the cellular texture. We have endeavoured, however, to give another view of this matter, and to show, that the oil taken into the stomach is at length truly mixed with the proper animal fluid, and makes a considerable part in the composition of it. And agreeable to the other parts of the theory on that subject, it seems proper to remark, that oil and oily matters are, from spontaneous instinct as it would seem, taken in especially with acescent substances, that is, with the most part of vegetables.

Which of the oils employed in diet are best suited to the purpose, we cannot distinctly perceive; and believe they are all equally proper, if they are equally free from other adherent matters, and from rancidity in themselves.

Whilst the most part of men willingly receive, and digest easily, a considerable portion of oily matters, there are certain persons whose stomachs digest them with very great difficulty, or not at all. I have known several who, in the course of a long life, constantly felt uneasy from taking in an oily matter, and therefore avoided them very entirely; so that I have known a woman of fourscore years who had hardly ever tasted butter. I have also known several persons who, at certain periods of their lives, could not find that oily matters, though taken down without aversion, were truly miscible with the other fluids of the stomach, but were ready to be thrown up by eructation in the same oily state they had been taken down in, and pretty entirely separated from the matters which they had been very intimately mixed with in diet.

There is also this considerable difference in using oily matters, that some persons can take, and readily enough digest, a portion of these, though they have contracted a good deal of empyreuma, and though they have acquired a good deal of rancidity; while many other persons, though they can take oily matters very freely, are, however, very ready to find them indigestible, if tainted with any degree of empyreuma or rancidity.

I thought it proper to mark these differences in the digestion of oils; but how they may be explained or accounted for I cannot find. We have of late had the existence of a gastric menstruum very well ascertained; but the causes of its different operation in different animals, and in different men, are by no means yet explained. Upon the supposition of this menstruum, and of its solving powers in general, I have endeavoured to assign the qualities of several different aliments; but the many differences of these which appear in different men, I do not pretend almost in any measure to account for.

With respect to the different digestion of oils just now mentioned, I will add an observation, which, though it does not relieve any of our difficulties, is a matter of fact, and therefore

to be marked. In several of the persons who could not find oils readily miscible with the other fluids of the stomach, I have found at the same time that their stomachs abounded with acid to an uncommon degree. What effect this may have, or if it may have any at all, upon the doctrine I have maintained above, that acid is a chief means of uniting oil with the other parts of the animal fluid, I leave my speculating readers to determine.

After the other vegetable aliments, I have set down the chief species of the *Esculent Fungi*: and as this country does not afford any variety of these, I have not experience enough to mark any different qualities that may appear in the several kinds: but what I have to say in general with regard to them deserves attention. If they are truly vegetable matters, which some have doubted of, they are truly different from every other vegetable that we are acquainted with; for in the first part of their distillation, without addition, they give out no acid, but a large proportion of volatile alkali; and exposed so as to undergo a spontaneous fermentation, they show no acescency, but become immediately putrid. By these two circumstances, ascertained by our own experiments, they show a very near resemblance to the nature of animal substances: and from hence their qualities are to be judged of. They seem nowise suited, as vegetable substances so universally are, to be joined with animal substances, with a view to obviate and moderate the tendency of the latter to putrefaction; and we also presume that they are more considerably nutritious than almost any truly vegetable substances are.

I here meet with a mistake made in the catalogue given above, owing to my hastily copying the catalogue that was inserted in the spurious edition of my lectures. There, after the *Cibi ex Vegetabilibus*, was inserted the sections of *Potus* and *Condimenta*; but it will be obvious that they ought to have been postponed till the whole of the aliments had been considered: and therefore I am now to follow that measure.

SECT. II.

OF ALIMENTS TAKEN FROM THE ANIMAL KINGDOM.

THESE are somewhat different, as they are taken from one or other of the six classes of Mammalia, Aves, Pisces, Amphibia, Insecta, and Vermes; into which naturalists, have now agreed to divide the whole subjects of the animal kingdom: and I shall now therefore consider the animal aliments as they are taken severally from these classes.

1. *Of Aliments taken from the Class of Mammalia.*

Of this class there are two orders, the *Primates* and *Cete*, which we shall not take any further notice of as alimentary; for,

though even the first among certain people may be such, and more certainly the latter is frequently such among many; yet as these are hardly used among civilized people, as we are almost entirely unacquainted with the use of them, and have no information with respect to them that can be depended upon, we shall take no further notice of them in this treatise.

Here we shall confine ourselves to the consideration of the aliments taken from those other orders of the Mammalia which by naturalists were formerly comprehended under the title of Quadrupedia.

Of many of these quadrupedia we use the milk which the females of certain orders afford, as a frequent part of our aliment; and as this is commonly and justly held to be of an intermediate nature between the entirely vegetable and entirely animal aliments; so it seems proper in passing here from the consideration of the one kind to that of the other, to give some attention in the first place, to this intermediate or mixed kind of aliment.

ARTICLE I. *Of Milk.*

We should perhaps begin this subject with explaining the manner and occasion of the production of milk in the female sex; but we reserve that till we shall have considered the nature of this fluid, as it may be ascertained by observation and experiment.

In doing this, we must limit ourselves to the consideration of those milks only which are used as aliment in this country; for although in other countries other milks are used, we have not sufficient information to enable us to speak distinctly concerning them. The milks, therefore, to be here considered are those of *Women*, or of the domestic animals, *Asses*, *Cows*, *Mares*, *Goats*, and *Sheep*.

These milks seem to have properties much in common with one another, in as far as they consist of parts which are nearly of the same nature in each; and the difference of milk seems to depend chiefly upon the proportion of these parts to the whole, and of the several parts to one another. It will therefore be allowable, and even proper, to begin with the consideration of milk in general.

Milk, as it issues, or is drawn from the vessels of the female that affords it, appears to be a homogeneous liquor; but after it has remained for some time at rest in the open air, it discovers itself to consist of different parts of substances, into which it spontaneously separates, and which are constantly found to be an *oily*, a *coagulable*, and a *watery matter*; or as they are vulgarly known under the names of *Cream*, *Curd*, and *Whey*. We are here to consider these parts in the order we have mentioned them.

The ordinary circumstances of this separation, so commonly oc-

curring under our eyes, need not be described here; but as it may be considerably varied by the circumstances in which the milk is exposed or kept, as well as by various artifices that may be applied to it, we shall, in considering the several parts, take notice of the several circumstances and artifices affecting the separation of them, and of the differences thence arising in the parts when separated.

We begin with the consideration of the oily part of milk, which is commonly the first that is spontaneously separated. When milk is drawn from the female animal that affords it, if no coagulating power is applied to it, and it is allowed to remain at rest for some time, it has a part spontaneously separated; which floats upon the surface of the whole; appears of a thicker consistence than what remains below, and is manifestly of an oily and unctuous nature. This is commonly known under the name of Cream: and though the separation of it will take place in close vessels, it takes place more quickly and completely if the surface of the milk be exposed to the air; and in larger quantity if it be exposed by a large surface, over which a gentle stream of air is constantly passing. The influence of the contact of air appears further from this, that as the cream first formed interposes a dense layer between the air and the body of the milk, more cream can be obtained from a given quantity of milk, if, as soon as a layer of cream is formed, it be taken off from the surface, and thereby a new surface be freely exposed to the air.

It seems also to be a measure for expediting and increasing the separation of the oily part, if the milk soon after it is drawn from the animal, be made to boil over the fire. By this a great quantity of air is detached from it; and the intumescence of the milk, which always appears upon this occasion, shows that the whole body of the milk is in every part of it greatly agitated. The theory of this effect of boiling is not very evident; but it seems to depend upon this, that the oily parts of milk are very minutely diffused among the different parts of it, and connected with them by the attraction of adhesion: but as the attraction of the oily parts towards one another should be still greater than towards the other parts of the milk, it is perhaps only necessary by some agitation of the whole to bring the oily parts in contact with one another, in order to unite them together, and thereby make them separate themselves more readily and copiously. I expect this will be found to be the theory of the manœuvre by which butter is commonly procured from cream, as will be mentioned hereafter.

The separation of cream is much affected by the state of the milk in its progress towards the other separations that are to take place. As after some time milk becomes acid, and not long after is coagulated into one mass; so, as the acescency proceeds, the separation of the cream is in some measure interrupted, and

upon the coagulation taking place it ceases altogether. It is therefore that as the acescency and coagulation are hastened in warm, and retarded in cold weather; so, according to the state of the weather, the production of the cream is greater or less. As thunder, and a certain disposition in the air to produce that meteor, is found to hasten the acescency and coagulation of milk; so this explains the effects of thunder, and of a certain state of the air upon the separation of cream.

The proportion of the oily part in milk depends upon different circumstances in the state of the animal affording it. There is undoubtedly in certain females a peculiar constitution disposing them to give a greater proportion of oil in their milk than other animals of the same species do, though both the one and the other be precisely in the same circumstances. What this depends upon is not clearly perceived. It may, and certainly in some measure does, depend upon the peculiar constitution of the animal: but it appears most frequently in animals bred in particular places, as the Isle of Alderney, the climate and soil of which I do not exactly know; but we are certain that it is constant in animals bred and reared in mountainous countries, such as the mountains of Switzerland and the Highlands of Scotland.

The constitution, however, of animals being given, various other circumstances give a different proportion of the oil in their milk. It is commonly greater as the age of the animal is more advanced, or as the animal is longer after its delivery; and especially it is greater as the soil of the pasture ground is drier, or as it has been for more years in pasture; and, on the contrary, as the soil is moister, and as the herbage is more succulent, the proportion of oil is diminished.

The proportion of the oily part of milk being thus ascertained, we have next to observe, that as it is at first separated in the form of cream, this, besides the proper oily part, always contains a certain quantity of both the coagulable and watery parts of the milk. From these the oil is to be separated by an agitation which we call churning; and by which it is obtained in the form of what we call butter. The theory of this operation we have hinted above; and as the process succeeds without the escape of air, or other mark of any fermentation, and succeeds under the admixtures of various substances, it is probable that it depends upon the agitation alone operating in the manner we have said: and the theory of it seems to be confirmed by its explaining at the same time the effects of boiling, which, in the Devonshire practice, allows butter to be procured from cream with much less agitation than is in other cases necessary.

As we have now considered the means by which the oily part of milk is obtained very much in its separate state, it is time to consider its nature and peculiar qualities.

This oil, in its recent state, is very much of the nature of

the expressed and unctuous oils of vegetables and that of animal fats, both in its sensible qualities and as examined by a chemical analysis. Butter is more consistent than the most part of vegetable oils, owing we suppose to a mucilaginous matter adhering, which seems also to adhere to those oils; but here probably the mucilaginous or caseous part of milk adheres more firmly on account of the acid of milk also adhering. Butter, like the other mild and fat oils, is liable to a change which we call Rancidity, in which it acquires a peculiar odour and taste, very commonly known, and, as quite *sui generis*, not to be described. Wherein such a change consists, is not yet well explained. It seems to depend upon the change, not in the proper oil, but in some of the matters adhering to it: for butter not well freed from butter-milk more readily becomes rancid than that which is more entirely separated from it; and butter by being melted and freed from a deposit which it makes on being kept in a melted state for some time, may be thereby preserved from rancidity; and in that case also it becomes of a more fluid consistence: all which, I think, implies, that it is more pure oil than it was before.

What is the nature of the matter which may be thus separated from butter, and is the proper subject of rancidity, it is difficult to determine: but that it is in part an acid, I judge from the rancidity's being promoted by the adherence of butter-milk; and from hence also, that rancid butter readily corrodes copper, which it did not in its recent state. Along with this acrid there is manifestly also a mucilaginous matter; and it seems to me, that in both these matters together a fermentation takes place, and gives the rancidity in question. This peculiar fermentation, however, is still little understood; and till it is better known, we cannot find, what is very much to be desired, the means of obviating the rancidity of butter, and of other fat oils. In the mean time, the only means we know of, that may be employed for butter, is the separating its acid and mucilaginous parts, and the application of sea-salt. If we employ a very perfect salt of this kind, we need to employ only a small quantity of it; and if at the same time we assist its antizymic power, by adding a small proportion of nitre and sugar, we may thus preserve butter very long in a condition fit to be used as an aliment.

After the oily, I am now to consider the Coagulable part of milk. In a few days after milk has been taken from the animal that affords it, the cream is in that time separated from it, and the remainder is spontaneously coagulated into a soft but somewhat consistent mass, comprehending the watery parts of the milk, which are always at the same time in an acid state; and indeed this acid state almost always precedes the coagulation of the whole.

In some time after the coagulation is formed, the watery part

separates from the properly coagulated, so that this may be collected more entirely by itself; and in that state it is frequently used in diet: but it is never collected, or attempted to be brought into a solid form, so as to get the appellation of Cheese. The spontaneous coagulum of cream, is sometimes employed to give a species of cheese. But every other species of cheese is made by an artificial coagulation; that is, by the addition of a coagulating matter, either to entire milk immediately after it is drawn from the animal affording it, or to milk after the cream has been separated from it, but before the spontaneous coagulation has come on. The coagulating matter employed for this purpose is named *Runnet*; and it is commonly produced by filling the fourth stomach of a calf with milk, which is there coagulated; and the stomach, with this coagulum included, is preserved for use in salt and water. The ordinary management and employment of this I need not take notice of; but it is very proper to observe, that the ordinary preparation of it has given occasion to a supposition, that the coagulating power of it depended upon the acidity that was found in the stomach of the calf, and communicated to the milk that was poured into it. But *Dr. Young's* experiments show clearly that the coagulating power of runnet does not depend upon that acidity; but is a quality residing in the substance of the stomach itself, as well as in the stomach of many other animals, and in many other instances the most remote from any suspicion of adhering acidity.

These experiments indeed leave us much at a loss in judging upon what the coagulating power of runnet, and of many other substances which may be employed as such, do really depend: and the whole of this business must be left uncertain till more experiments shall be made. In the mean time, it is enough to our purpose to observe, that the cheese, which is used as an aliment, is always made by the use of the ordinary runnet; and therefore that nothing distinguishes the qualities of the cheese made, but the kind and qualities of the milk of which it is prepared, and the various circumstances and practices which take place in the preparation of it. But before entering upon the consideration of the several species of cheese, I must say something of the nature of cheese in general.

A quality belonging to every species of cheese is, that it is liable to putrefaction; and by this it may be said that it approaches to the nature of animal substances. This opinion is confirmed by the matter of which cheese is formed, being, like animal substances, coagulated by acids, alcohol, and heat. It is true, that the two latter, and even the mineral acids, do not act upon the coagulable part of milk in the same circumstances and in the same manner as they do upon the serum of animal blood; but still they do act upon milk in a manner that shows a great similarity of the two subjects. The animal nature of cheese is especially con-

firmed by its yielding in distillation a volatile alkali. This indeed is a disputed fact; but I assume it upon the authority of eminent chemists, and upon actual experiment made under my own eye. A pound of skimmed-milk cheese, not in the least affected by putrefaction, yielded in distillation, first, a very pure water, very slightly acid; secondly, a liquor which effervesced strongly with the mineral acids; and, thirdly, there came over an alkaline salt, concreting every where on the inside of the receiver; and, in the last place, an empyreumatic oil.

Upon the whole, therefore, I conclude, that cheese, or the coagulable part of milk, is very much of the nature of animal substances. And if we shall adopt the common opinion, that milk is especially formed of the chyle or newly taken-in aliment, we shall readily perceive that this must be always blended with the lymph which it meets with in its passage through the lacteals and thoracic duct; and we shall then also admit, that this lymph makes a part, and particularly the coagulable part, of milk. We judge, therefore, that milk is properly supposed to contain a portion of animal matter; and at the same time, that the milk of animals feeding wholly, or for a great part, on vegetables, may be justly supposed to be an aliment of an intermediate kind between vegetable and animal.

This is our doctrine with respect to cheese in general; but it is now to be remarked, that cheese, as employed in diet, is of very different kinds. We have said already that cheese is hardly ever made of the substance formed by the spontaneous coagulation of milk, and at least only in the case mentioned above. In all other cases, cheese is formed of curd produced by the application of runnet: and the cheese thus produced is distinguished in the first place by the condition of the milk it is made of. Thus the runnet may be applied to entire milk, as it is drawn from the animal affording it; or it may be applied to that milk after it has been previously deprived of its cream; or it may be applied to the cream separated from the watery parts of the milk; or it may be applied to a portion of entire milk, to which is added a quantity of cream taken from another portion of the same milk: from which especially a considerable difference of cheese may arise from the different proportion of the coagulable and oily parts in the milk employed. Lastly, the milk employed may be that of one animal only; or it may be a mixture in different proportions of the several milks employed in our diet, but especially those of cows, goats, and sheep, the only milks from which cheese is prepared in this country.

Besides these differences of cheese, arising from the state and quality of the milk employed, there are many other differences arising from the various practices employed in preparing it; as by the different circumstances of the coagulation; by the management of the coagulum or curd; by the pressure given to it; by

the salting and drying; and by the manner in which it is afterwards preserved. These considerations will show the very great variety of cheese as it is presented upon our tables: but I am not able to explain all the causes of this variety; and it does not appear necessary to attempt it, as they relate more to æconomy and taste than to our present purpose of considering it as an alimentary matter.—This we shall consider after we have treated of all the several parts of milk; and at present shall touch only upon a curious question with respect to the variety of cheese.

Cheeses are commonly distinguished by the different districts of the country producing them, and in many of which they are often of a peculiar kind. From what has been already said, it will readily appear that the practices of different countries may differ very considerably, so as to give a different state of the cheese produced; and for the sake of the particular qualities they may possess, or at least for the purpose of accommodating them to particular tastes, it might be desired that the practices of different countries should be ascertained, so that they might be occasionally imitated. This, however, is extremely difficult; and the reason of it seems to be, that when in any manufacture the circumstances of the materials, and the practices employed in working upon them, may be greatly varied, it must be almost impossible for any two persons who have not often operated together, to take exactly the same measures in every step of a long process.

Having thus suggested what seemed to be proper at present concerning the caseous part, it remains now to consider the third ingredient in the composition of milk; that is, the watery part, or, as it is commonly called, the Whey.

A pure elementary water is always a very considerable part of milk, as appears when we consider it according as it is either spontaneously or artificially separated from the other parts of the milk, or when after it is separated we examine it by evaporation, applying such a gentle heat as can hardly volatilize any other matter but the pure water. In such cases, both from *Hoffman's* and from *Young's* experiments, it appears that the water is at least seven-eighths of the whole milk.

From hence it may be observed, that milk is always to be considered as a very liquid aliment; but it is at the same time to be remarked, that this is not equally applicable to the different kinds of milk: for although the proportion of oily and coagulable parts be considerably different in different milks, yet the proportion of the watery part is not so much varied. The residuum of four ounces, after evaporation, of cows' milk is very nearly the same; as in the former it is three drachms and thirty-four grains.

The watery part separated from the other parts of milk is different according to the state of the milk from which it has been

separated: but under whatever circumstances separated, this watery part is always found to hold dissolved in it a quantity of matter which is different in kind, and different in proportion, according to the state of the milk at the time of the separation of the watery part.

When the watery part is taken from new milk coagulated by runnet, and when we especially name it Whey, it always contains diffused in it a considerable quantity of the oily and caseous parts, which by certain practices can be again separated from it. When whey is separated from skimmed milk, or that which has been previously deprived of its cream, it still contains a quantity of the caseous part, but less of the oily. When the watery part of milk is separated from the oily by churning, we name it Buttermilk; and it contains a large proportion of the caseous part, with very little of the oily. Lastly, the watery part may be separated either from entire or from skimmed milk, in consequence of spontaneous coagulation; and in this state it is always acid, and at the same time is the most entirely freed from both the oily and the caseous parts. In these different states, the qualities of the watery parts of milk as an aliment shall be taken notice of hereafter.—Having thus mentioned the different states in which we obtain the watery part of milk, we now return to consider it in that state in which we most commonly employ it, that is, as it is obtained from entire milk, in consequence of its coagulation by runnet. In this state it is different according as the milk is taken from different animals, and not always in proportion to the contents of the several milks in their entire state. Thus, as cows' milk seems to contain a larger proportion of oil than that of goats, it might be supposed that the whey of cows' milk should contain more oil than that of goats' milk: but the contrary appears to me to be the case: and it seems to depend upon this, that the oil of goats' milk does not so readily separate itself from the watery parts as it does from that of cows, but remains more tenaciously adhering to it, and therefore to be more copiously separated with the whey.

Besides the oily and caseous parts which we have mentioned to be always contained in whey, it contains also a saccharine matter, which may be separated from it by various processes practised either on the milk or on the whey, and now very commonly known. The matter obtained by these processes is a genuine sugar, and differs from that of the sugar-cane only by its having some of the oily or caseous parts of milk adhering to it, but from which it may, by repeated solutions and crystallizations, be entirely freed, and thereby be brought to the same degree of purity as any other sugar.—Whey, as containing this sugar, is capable of a vinous fermentation, and consequently of affording by distillation an ardent spirit.—It is by the presence of the same sugar that whey so readily enters into an acescent fermentation, and becomes acid in

the several circumstances mentioned above. It appears that this acid, by being kept for some time, becomes more considerably acid, and probably an acid of a peculiar kind; though, so far as I yet know, it has not been chemically examined.

Having now considered the several parts of which milk in general consists, it will be proper, in the next place, to enquire in what proportion these parts are to be found in the several milks employed in the diet of men in this country.

These milks are those of ewes, goats, cows, mares, women, and asses; the three former being those of ruminating, the three latter of non-ruminant animals: a distinction which I mark, though I cannot explain in what manner the circumstances of ruminating or not ruminating affects the state of the milk.

To mark in these milks the proportion of the several parts, I follow the experiments of *Dr. Young*; and, according to him, the proportions of the caseous parts is in the order I have just now given them, greatest in the first and less in the following, and that in the order above stated. It is evidently considerably greater in the ruminant than in the non-ruminant animals. In the former it may be pretty exactly ascertained; but in the latter with much more difficulty: and it appears to me that many more experiments than have yet been made are necessary to ascertain the circumstances which affect their coagulation, and consequently the proportion of their caseous parts.

The proportion of serous parts, as might be expected, is mentioned by *Dr. Young* to be inversely that of the caseous part in the order above mentioned, as will appear from his Table, page 59. But it might be supposed also that the serous parts should be in the same proportion as the watery parts found by evaporation: but we doubt if the experiments on this subject be sufficiently exact; for there is some difference in the account *Dr. Young* gives of the residuum after evaporation of the several milks, at the end of Sect. 3. of Chap. viii. from the particular experiments given in the former part of his work.

The proportion of the oily part is greatest in the milk of ewes, next in the milk of cows, and less in that of goats; but I judge it difficult to determine this, as the oily part of goats' milk does not so readily separate itself as in that of cows from the other parts. In the non-ruminant, women's milk seems to contain more oil than the milk of mares or asses: but this does not seem to depend so much upon the difference of constitution as upon the difference of diet; for women commonly take in more of oily matter than mares or asses do: and I know from experiment that the proportion of oily matter is much diminished by their being confined strictly to a vegetable diet.

We have thus stated the proportions of the several parts of milk in the several kinds of it, nearly as it has been ascertained by experiments already made; and the proportions here assigned,

may, I trust, be assumed, in any reasonings we may enter into upon this subject: but before quitting the subject we must observe, that in comparing the milk or milks of two different animals, the experiments already made cannot be of the utmost exactness; for as the milk of every individual is varied by peculiarity of constitution, by the age of the animal, by the distance of time from delivery, and by the difference of diet; so in comparing the milk of two different species, unless the two individuals are taken exactly in the same condition with respect to the circumstances just now mentioned, the result cannot afford any general rule with respect to the two species. I give an example: though ewe's milk commonly affords more cream and butter than that of cows, yet I believe there may be found an Alderney cow whose milk will give more cream and butter than that of any ewe.

The same consideration will perhaps account for some difference that is to be met with in the experiments of *Dr. Ferris* from those of *Dr. Young*, with respect to mares' and womens' milk: and it is to be remarked, that womens' milk is more varied by the state of diet than that of any other animal whose milk we employ; and particularly that this renders the rank which womens' milk holds in the tables of *Young* and *Ferris* to be a little uncertain.

Having thus considered milk in general, and also in the several kinds of it, we may now proceed to consider in what manner this liquor is produced in the female sex. The question might first be, How it happens to appear for the first time in a certain circumstance of the female body, that is, immediately after the production and delivery of their offspring? But we choose to delay this question till we shall have first considered in what manner it is produced during the whole of the time that the female continues to afford it.

The common opinion on this subject is taken from the seeming resemblance of the milk to the chyle, into which our aliments taken into the stomach and intestines are always converted before they pass into the blood-vessels: and from this resemblance it has been supposed that the chyle, without being mixed with the other parts of the blood, is directly carried to the mammæ of females, and appears there in the form of milk.

This doctrine, however common, we cannot admit of; and think it is founded upon, and has in its turn produced, several errors in physiology. In the first place, we cannot admit that the chyle, after passing into the blood-vessels, remains for any length of time unmixed with the other parts of the blood: and in the observations which assert its having been found soon after the taking in of aliment appearing in a separate state, I judge there has been much mistake, and that some other appearances of the blood have been mistaken for chyle; as we know to have

happened in many instances; or if it be possible that in certain cases the appearance of chyle has been real, it is certainly not the ordinary course of the animal æconomy; for there have been innumerable instances of blood drawn from the veins at various intervals after the time of taking in of aliment, without its exhibiting any such appearance. It is indeed almost impossible that it should take place. The chyle does not pass into the subclavian vein but in a great length of time; and therefore in a small quantity only at once, and is therefore immediately blended with a large proportion of blood. The diffusion increases as the whole is carried to the right ventricle of the heart; and in this, as well as in the subsequent passage through the lungs and left ventricle of the heart, the whole is acted upon by powers which must blend and diffuse the chyle in the most minute and intimate manner amongst the parts of a highly-coloured fluid. This must render it almost impossible, that in any part of the arteries or veins the chyle should afterwards appear united in one mass, and of its own proper colour, unless it could be shown that upon the stagnation of the blood, there was a power disposing the chyle to separate itself from the other parts of the blood; which is not alleged: nor could it possibly have existed without showing an appearance of chyle in many instances of extravasation, when, however, it certainly does not.

The supposition, therefore, that milk is especially afforded by the chyle in the same condition as it is received from the thoracic duct into the blood-vessels passing to the *mammæ* of females, and there giving the same matter and qualities we perceive in milk, is very ill supported by the notion of the chyle's remaining separate from the other parts of the blood for some time after it has been taken into the blood-vessels. How much soever of the aliments recently taken in we may find going to the production of milk, we shall find it very improbable that chyle takes that course in the same form and in the same crude state in which it enters the blood-vessels: and we shall find it much more probable that milk is produced in the *mammæ* of females by the peculiar, though mysterious powers of secretion.

But although milk be not the same fluid which passed from the thoracic duct into the subclavian vein, there are many arguments which lead us to suppose that the matter of milk is chiefly afforded by the matter of the chyle, or of the alimentary matter last taken in. These arguments, however, are commonly employed very incorrectly, and carried too far. One argument employed upon this subject is, that the peculiar odour of the aliments last taken in often appears in the milk which is soon after secreted: and this, although it is in several instances true, is by no means universally so: for I have known many instances of nurses taking in a quantity of odorous matter without its appearing in their milk; and even if the appearance more universally took place, I cannot hold

it as a proof of any considerable portion of the aliments taking that course. Certain odours are wonderfully diffusible, and often appear when no great quantity of matter affording them is present in the same place. And we might here employ the same reasoning as we did before with respect to asparagus in the urine; and therefore argue, that the odour of aliments being perceived in the milk secreted soon after, affords no proof that much of the matter of the aliment had taken that course.

But it is alleged further, that other qualities often appear in milk, which show that a great portion of the particular matter of the aliments had contributed to the production of that fluid. This may perhaps in some instances be well founded; but I suspect that the facts alleged to this purpose have been much exaggerated. It has been, for example, alleged, that purgatives given to a nurse have affected her suckling. But *Dr. Young*, although intent upon the enquiry, never found this to be so: and I am certain that in fifty instances that I have known, the child was not affected by purgatives given to its nurse; and though in some instances it should have been so, considering the subtle and small portion of matter in which the power of purgatives often resides, I would still think it a weak proof that a great part of the aliment constantly took that course. That the particular qualities of aliments do not affect the milk secreted after their being taken in I know from this, that many nurses take in considerable quantities of intoxicating liquor, and are themselves intoxicated by it; but I have not known any instance of the intoxicating power being communicated to their suckling.

One of the strongest arguments for proving that the aliment lately taken in contributes especially to the production of milk, seems to be, that the quantity of milk secreted is always considerably and immediately increased upon the taking in of aliment; and that if aliment at any time has not been duly taken in, the secretion of milk is evidently diminished. All this is true; but it appears especially with respect to the liquidity of the aliment: and that a quantity of liquid taken into the body should increase every secretion will be readily understood; and particularly that it should increase the secretion of milk, which consists of such a large proportion of water, is sufficiently obvious. Every body knows that the enabling a nurse to afford a large quantity of milk, depends much more upon her taking in a large quantity of drink rather than of solid food. How much the secretion of milk depends upon the supply of liquid, I have learned from a particular phenomenon. I have known nurses who have been for the time quite free from thirst; but upon a child's being put to their breast, and beginning to suck, they were immediately affected with a considerable degree of thirst. This I would consider as an institution of nature, showing the supply of drink to be especially necessary to the

supply of milk. Upon the whole, therefore, I cannot find the increase of the secretion of milk by the taking in of aliment to be any proof that much of the solid matter of the aliments, or any entire portion of the chyle, goes immediately to afford that secretion.

I have thus endeavoured to correct the mistaken notion of the chyle, such as it was received into the blood-vessels, affording immediately and very entirely the matter of milk. But although I have rejected some, and endeavoured to weaken others of the arguments employed upon this subject, I do not mean to reject entirely some of these arguments from our consideration. After all I have said, milk, besides water, contains a portion of other matter; and we must say from whence this is drawn. The oily and coagulable parts may be drawn by secretion from the mass of blood in almost any state of this; but besides these parts, there is a saccharine matter which very rarely appears in any part of the mass of blood, and may with confidence be presumed to be afforded by the saccharine matter of our vegetable aliments, while they remain for some time unassimilated to the proper animal fluid.

I own there may be a fallacy in this reasoning; as the disease of diabetes has shown that the powers of the animal economy can either produce or extract from our aliments a larger proportion of sugar than usual, and also preserve it longer in an unassimilated state: so we do not well know what effect this power may have upon the secretion of milk, till we shall meet with what has not yet occurred that I know of; that is, a woman in milk affected with diabetes.

Laying aside, however, this speculation, thrown in here as somewhat curious by the way, I go on to say, it is sufficiently probable that the saccharine matter of milk is taken from the saccharine matter of vegetables, as it has recently been taken in, and yet remaining in an unassimilated state: for we every day observe that the quantity of milk in the breasts of women is increased by the taking in of vegetable aliments. That the taking in of vegetable aliment is absolutely necessary to produce such an acescent milk as we commonly find in the breasts of women, we learn very clearly from *Dr. Young's* experiments upon bitches. A bitch fed with vegetable aliments alone, afforded a milk acescent and spontaneously coagulating, like that of the ruminating animals; whereas the same bitch for a little time fed entirely with animal food, afforded a milk manifestly alkaline, and not spontaneously coagulating. The application of this in practice we shall consider hereafter; but for the present it is enough to observe, that these experiments plainly show that in animals, such as women, using a promiscuous diet, the state of the milk produced will be very much more acescent or alkalescent according to the general character of the diet; but in animals using a vegetable diet alone, I

can hardly conceive any other difference to arise than that of a greater or lesser quantity; and we do not imagine that any substances purely medicinal can in that respect have any effect.

The organs of secretion in animal bodies are curiously adapted to one specific secretion; and so much to that alone, as hardly to admit of any other matter unsuitable to that, to pass through the organs of it. There are indeed instances of these organs transmitting matters which should not make a part of their proper secretion; but these exceptions are so much fewer than might be expected, that they only serve to confirm the general rule. We have just now several instances of the breasts of women rejecting matters not suitable to form milk, sufficient to show that the common supposition of the ready passage of such matters to the mam-mæ must be ill founded. The goat is a multivorous animal: and some vague notions have been formed of the qualities of its milk and whey from this variety of its food; but I can say from much experience, that a difference in the state of its milk is very rarely to be observed: and upon the whole we would allege, that the projects of *Galen* and *Hoffman* for impregnating the milk of cows or asses with medicinal substances, are improbable and frivolous attempts towards refinement.

The general qualities of milk, and the different states of it which may take place in the several species of animals, or even in the same individual at different times, being now considered, we proceed to what is especially our business here, to treat of the use of milk as an alimentary matter.

In entering upon this subject, what first presents itself is the use of milk as the proper nourishment of the new-born animals of the class of mammalia. In what manner it is adapted to the whole of these, I dare not attempt to explain; and must confine myself to the consideration of the new-born offspring of those animals which afford the milks employed in the diet of this country, and very much to the consideration of what relates more especially to the human species.

The first production of milk being always at the same time with the production of the offspring, and with this of the organ affording milk provided with teats, or parts suited for sucking, and the new-born animal being instinctively directed to, and instructed in, sucking, leaves no doubt that the milk produced is particularly intended for, and adapted to the nourishment of the new-born offspring; and we are now to attempt explaining more particularly how it is adapted to that purpose in the human species.

On this subject the physiologists have satisfied themselves very easily, in saying, that as chyle affords milk, so milk affords chyle without the assistance of the digestive organs, which, as they have not been before exercised in it, may not be immediately prepared for their function. But as we have shown that the former posi-

tion is not true, so we judge the latter to be no better founded. It seems probable that milk does not enter the lacteals in the same state in which it had entered into the stomach: for it appears that milk taken into the stomach is by a runnet applied to it always coagulated there; and therefore needs the solvent power of the gastric fluid to bring it again into a fluid state: and it appears also probable, that milk becomes more or less acid in the stomach: and therefore that a certain combination with animal fluids is necessary to put it into that condition which chyle is always in when it enters the lacteals. Milk, therefore, taken into the stomach does not by itself become chyle; nor is it by its being already prepared chyle that it is fitted for the nourishment of new-born children. We must, therefore, seek for another answer to our question: and there seems to be one very obvious, though not hitherto taken notice of by the physiologists.

Whilst the fœtus or beginning animal remains in the womb of the mother, the whole of its fluids are the same with those in the vessels in the womb from which they are drawn, and are therefore as fully in an alkaliescent state as the human œconomy admits of. But we know also, that even in adults this state of the blood, unless it were obviated by the excretion of the more alkaliescent parts, and by the taking in of fresh and less alkaliescent aliment, would soon pass into a vitiated and dangerous state. But the blood of a new-born child is in the condition disposed to such a change; and it is therefore necessary to give it a supply of aliment, and of aliment not quite alkaliescent. Vegetable aliment in this view might seem suited to the purpose; but it is probable that an aliment of this kind would neither be suited to the powers of digestion nor immediately accommodated to the state of the infant vessels, adapted hitherto to a fully alkaliescent blood. An intermediate nourishment, therefore, that may introduce the change by degrees, seems to be necessary; and such an intermediate aliment is milk.

We do not discern with any precision the different states of the alkaliescency in the blood of different animals; but we presume that it is more considerably alkaliescent in the entirely carnivorous animals than it is in the human species, living partly on animal and partly on vegetable aliments. A certain lower degree than of the most alkaliescent state of the blood seems to be suited to the functions of the human œconomy; and from hence it is that man is instinctively directed to the use of vegetable aliments.

For purposes, however, which we cannot clearly explain, the vessels of the fœtus are first filled with as fully alkaliescent blood as they are in those of adults. But to bring the blood into, and preserve it in, that state which is best suited to the functions of the human œconomy, it was necessary to introduce a vegetable aliment into the infant; and accordingly we find, that even for

the first years of life, health is best provided for by a large proportion of vegetable food. So considerable a change, however, could not be safely made in an infant but by degrees; and therefore for some months of infancy such a mixed aliment as that of milk was most proper. All this is confirmed by our experience of the inconveniencies that have attended all the attempts to introduce very early the large use of entirely vegetable aliment.

We have thus endeavoured to explain why milk is especially suited to the nourishment of new-born children; and hardly any body has ever doubted of it, but the so frequently whimsical *Van Helmont*. Of late *Mr. Brouzet* has bestowed an attention on this opinion of *Van Helmont*, which appears to me to be equally frivolous and ill founded.

While milk is judged to be the proper nourishment of new-born animals, there can hardly be a doubt that to every new-born animal the milk best adapted to it must be that of the species it belongs to, and consequently that of the mother who had immediately produced it.

The reasonings on this subject employed by *Mr. Brouzet* appear to me very unsatisfactory, and often erroneous; but as his opinions have not, so far as I know, prevailed among the learned, it does not seem requisite to bestow here the time and pains that might be necessary to correct them.

How long this nourishment is the best adapted to infants, it is difficult to determine; but the very purpose of multiplying the species shows that nature has set some limits to it. So far as we can trust our observations on the human species, we find inconveniences from either too short or too long nursing: and it appears to me that either less than seven, or more than eleven months, is generally hurtful; so that the ordinary practice of nine months seems to be well founded. From some accidental circumstances this measure may be safely varied; but what are the circumstances of the infant's constitution that require it to be varied more or less, has not that I know of, been properly ascertained. The making it somewhat longer than the usual term is the safest; but I am persuaded that long nursing contributes to increase the disposition to rickets: and wherever children are slow in their teething, it seems improper to protract their nursing.

Having thus determined, as well as we can, the length of time that it is proper to employ the mother's milk, another question arises, How long it is proper to employ that alone, or how soon it is proper to employ an aliment of another kind? It has been already observed, that the very early introduction of vegetable aliment is improper: and we are persuaded that it cannot be introduced with safety for some months after the birth; but for how long precisely we dare not determine. From my own observation, I am led to think that hardly in any case it should be introduced till five months are past; and even after that period, that it should be increased by

degrees only to the time of weaning, so that at this last period no considerable change may be made.

Further, it relates to this subject to observe, that in some infants even the mother's milk is not properly digested; and particularly, that it becomes more acid than it should, and thereby produces disorder in the infant. How this is to be obviated or cured, it would be very desirable to say; but I do not find myself enabled to do it very clearly. It is not indeed always easy to perceive what is the cause of the disorder, whether it be the state of the nurse's milk, the state of other nourishment given at the same time, or the state of the child's stomach.

With respect to the first, it might be perhaps suspected that a too acedent diet given to the nurse might be to blame: but I have not perceived this; and I have observed the disease to happen as often to the sucklings of nurses who took a good deal of animal food, as to those of nurses who lived more entirely upon vegetable aliment: and I have known that when the disease was attempted to be cured by giving the nurse a larger proportion of animal food than usual, this has not answered the purpose.

With respect to the second cause, I am persuaded it is sometimes to blame; as I have observed that in several instances the disease happened to children who had been soon put upon the use of vegetable aliment; which produced an acid different from that of milk, and more difficult to be obviated or corrected by the digestive powers of the infant.

With respect to the third cause, as I have observed the digestive powers of some infants capable of overcoming the faults both of milk and other aliment, so I have no doubt that in others the weakness of these powers is often the cause of the disorder we are treating of: but when even this is the case, I find it difficult to discern that the fault is in the digestive organs alone; and can only suppose it when other marks of debility in the whole system are to be perceived. One mark of weak organs of digestion may, I think, be coagulated milk passing with the child's stools.

From this uncertainty with respect to the causes, it must be difficult to say in general how the disease is to be cured; and it must be left to skilful practitioners to judge of the causes in particular cases, and to direct their practice accordingly.

Upon the subject of the chief use of human milk, it remains only to say what may be most proper to put nurses in the best condition to afford milk in the greatest plenty, and of the most proper quality. To this purpose I need not say, that if a nurse is chosen of a sound constitution, whatever in general is proper to preserve health is the chief, perhaps all, that is necessary to make her a good nurse. What are the measures in general proper for this purpose, it is not requisite to say; and the only particular that we are engaged to consider here is, that after having said so

much of the connection between the diet employed and the milk produced, that we should determine as well as we can what is the most proper diet for nurses.

To ascertain this, we may observe, that the milks employed by the human species are all taken from animals living very entirely upon vegetable aliment; and therefore that a milk produced from that is sufficiently well suited to the human æconomy: but that it is the best suited to it may be doubted from hence, that the milk destined to new-born children is the milk of women, who are capable of employing and do commonly employ, a mixed diet of animal and vegetable matter; from which it might be inferred, that a milk afforded by such a diet was the best suited to the human æconomy even in the infant state.

If, however, it be considered, that women's milk contains as much vegetable matter as any other, and that nature has appointed it to be employed at a time when the chief purpose seems to be the introducing a vegetable matter, the use of a diet allowable, and perhaps necessary, at other times, does not afford an argument for its being proper upon this occasion.

I might say a great deal to show that the human æconomy, except in a few instances, does not absolutely demand the use of animal food; that in fewer instances still does it demand it in large proportion; and that for the most part the health of the human body is best preserved by a large proportion of vegetable food. So from all this I think it will readily follow, that the health of women during the time of their nursing may be safely sustained by the use of vegetable aliments alone.

From the employment, therefore, of animal food by the human species, there arises no argument for the necessity or propriety of a woman's taking animal food during the time of her nursing. I allege it to be a matter of experience, that supposing the quantity of liquid to be the same, nurses living entirely, or for the greater part, upon vegetable aliment, afford a greater quantity of milk, and of more proper quality than nurses living upon much animal food. This I venture to assert from the observations of fifty years; during which time, I have known innumerable instances of the healthiest children reared upon the milk of nurses living entirely upon vegetable aliments; and I have known many instances of children becoming diseased by their being fed by the milk of nurses who had changed their diet from entirely vegetable to the taking in a quantity of animal food. Nay, I have known instances of childrens' becoming disordered from a nurse's making a single meal of an unusually large proportion of animal food.

If it be the purpose of nature, as it seems to be, to give infants milk of an acescent kind in pretty large quantity, *Dr. Young's* experiments on bitches serve well to show how necessary a vegetable aliment is for that purpose; for these experiments inform us, that by feeding a bitch upon animal food alone, not only the

quality of it was greatly changed, but the quantity of it also diminished.

To these arguments in favour of the employment of vegetable aliments by nurses, an objection might be made from what has been said above of the morbid acidity that sometimes occurs in the stomach of infants, and which may sometimes be imputed to an unusual acescency in the nurse's milk, arising perhaps from the acescency of their diet. The possibility of such a case shall not be denied; but we are persuaded it is a very rare occurrence.—Indeed such is the power of the animal œconomy to change the quality of acescents to an alkalescent state, that I believe the excess of acescent aliments, or even of acidity produced from them, is never discerned beyond the *primæ viæ*, except in the supposed case of milk.

Even here, however, it cannot be certainly said that it ever goes beyond what the œconomy requires: for an acid was never found in recent milk; and in the case of nurses, it may be presumed that, as in other persons, the quantity of gastric and intestinal animal fluids, and the quantity of lymph that is always mixed with the chyle, is such as, joined with the action of the lungs, will always prevent any great excess of acescent matter prevailing even in the milk. It seems to me highly probable, that were it not by the power of secretion, the saccharine and acescent matter would not appear there. From these considerations, and from the fruitlessness of a change of diet towards correcting the suspected acescency of a nurse's milk which I have experienced, I am persuaded that the noxious acidity which often appears in the stomachs of children is never to be imputed to the acescent diet of the nurse, but to some of the other causes mentioned above.

Together with these considerations I shall beg leave to suggest another in favour of the vegetable aliment of nurses; at least against their large use of animal food.

It appears to me, that in nurses, for a certain length of time, the determination of the blood to the uterus and ovaria is suspended; so that during that time neither menstruation nor conception take place. We know, notwithstanding, that in some nurses both these states occur; and I am persuaded that they most readily take place in habits naturally plethoric, or rendered so by the large use of animal food. It is, however, generally and probably upon observation judged, that both menstruation and conception are always incompatible with the proper condition of a nurse; and therefore to avoid these inconveniencies, it seems proper for nurses to avoid animal food altogether, or at least to take it very sparingly.

This suggests an observation that will be proper before we conclude this subject. In the earnestness I have just now expressed in recommending vegetable aliment to nurses, I had chiefly in view the state of hired nurses; who being frequently taken from the

lower class of people, and who had been for the whole of their life before fed by vegetable food alone, so I had always observed bad consequences from their being put upon animal food. But I must observe here, that it is possible that hired nurses may have been before partly in the use of animal food, and that with respect to such, there may be an exception to the taking away such food entirely.

The exception, however, that I intended especially to mark here, is with respect to women of condition who may choose to nurse their own children. Such women have pretty certainly been accustomed to animal food, and perhaps to a large proportion of it; and I should not think it by any means safe to take it away from them entirely; but it would be very necessary to diminish the quantity of it a good deal, and more or less according to former habits.

It now remains to consider the use of milk as an aliment for adults. It is seldom that the milk of women, or of asses and mares, is employed for the whole, or even for a great part, of diet; but when they can be employed in sufficient quantity, there is no doubt of their being sufficiently fit for the purpose, though certainly affording a weaker nourishment than an equal quantity of the milk of ruminant animals. It is the milk of the latter, and especially that of cows, that is employed in this country; and it is almost only with respect to this that I have had sufficient opportunities of making observation, so as to treat of it properly here.

As the different parts of which milk in general consists are all of a nutritious quality, and probably better suited to the purpose by their being introduced in a very liquid form; so cows' milk commonly contains so much nutritious matter as to render it a very proper aliment: and we know that it is often sufficient for the whole of the nourishment of a man, and at least in many instances that it can serve for a very considerable part of it.

While it is thus in general suited to the nourishment of men, it seems to be equally fit for them at every period of life except for a few months of infancy: when, though cows' milk has on certain occasions answered the purpose, yet from what has been said above, it does not seem in any case quite so fit as the milk of women.—At every other period of life except that last mentioned, there can be little doubt of cows' milk being a sufficiently fit nourishment; but it may be more or less so at different periods. The younger children are, within the bounds mentioned, it seems to be the more fit; as at the same period, for the reasons given above, that vegetable aliment is necessary: but as it is doubtful if the human economy can be properly supported by vegetable aliment alone; so milk, as affording a proportion of alkaliescent matter, will be properly joined with it: and we know instances of a numerous people who are sustained in a condition fit for all the functions of life by milk and vegetable aliment alone.—There can be no doubt, therefore, of the

propriety of rearing children in the same manner. I believe it is hardly ever necessary to give children under the age of puberty any quantity of animal food; and we have innumerable instances in this country of children reared to the most perfect health and strength without the use of it, except the small quantity of it that is given by an egg, and this very sparingly and seldom bestowed. On the other hand, I have often observed that animal food much employed under the age of puberty, has very hurtful effects, particularly in giving irritability and an inflammatory disposition to the system. We are indeed of opinion that a certain portion of animal food is intended by nature, and is very well suited to the human constitution; and in cold climates at the period of life when men are to be engaged in the laborious business of life, that animal food is then especially proper, and perhaps necessary, while at the same time that milk may be less sufficient for the purpose.

How long this state may continue I dare not determine; but whenever the powers and vigour of life begin to decline, as we are persuaded that the alkaliescent state of the fluids is always increasing as life advances; so the more this happens, we are inclined to think that the more plentiful use of milk and vegetables, may be again introduced.

It appears indeed clearly enough, that milk in a certain proportion, is an aliment very well suited to every period of life, and might be constantly employed except in certain persons whose stomachs do not seem to digest it properly. From what cause this happens, it is difficult to determine. In every stomach milk is coagulated; but in certain stomachs it seems to be coagulated more firmly than in others, and in that state to resist the solvent powers of the gastric fluid: and we have had instances of this in which milk taken into the stomach was after many hours rejected by vomiting in large curdled masses. What this depends upon I do not know, nor have indeed learned how it is to be remedied.—In other cases we have found that milk was more ready to become acid in certain stomachs than in others; and there is little doubt that in these also a coagulation takes place: but as we know that milk spontaneously coagulated, or coagulated by acids, is often taken down with perfect impunity; so it appears to me that the coagulation which is here joined with acidity has little or no share in the disorders which follow.

These disorders from the acescency of milk are the same, though perhaps not so violent as from acescent vegetables; and the caution that some have expressed for avoiding the combination of milk with acescents in diet, is without foundation; for I have known innumerable instances of its being practised with perfect safety.

Milk is certainly hurtful by its acescency in no other case but where the stomach is preternaturally disposed to an acescent fer-

mentation; when indeed it may be hurtful, and like other acescents aggravate the disease. It is, however, to be observed in favour of milk, that when the serous part of it becomes acid in the stomach, the oily and caseous parts are particularly fit for re-absorbing and uniting with the acid towards forming an animal fluid: and it is upon this account, if I mistake not, that for the most part milk is of easy digestion, and soon fills the lacteals with chyle. Of its fitness to unite with acids we have this proof, that milk, when coagulated by acids, has that acid always joined to the coagulated part; and in the first appearances of spontaneous coagulation, the acid which is formed nearly at the same time is always intimately united with the coagulated part. It is in proof of this that I have known many instances of heartburn, from acidity prevailing in the stomach, immediately cured by a draught of fresh milk.

Having thus suggested what relates to milk as an aliment, it may be proper also to say a little of it as a medicine, as I shall not have another opportunity of doing so in this work.

It has been mentioned above, that though milk as taken in is not chyle, yet it is readily, and perhaps more readily than any other aliment, formed into a proper chyle; and therefore wherever the digestive organs are weak, milk may more certainly than any other matter supply nourishment to the body. Upon this account milk is a restorative medicine in all cases of emaciation and debility, at least in all cases where the digestive organs are not affected in a manner that renders them unfit for the digestion of it.

Not only, however, in a weakness of the solids, but also in every case of vitiated fluids, milk may be supposed to be a remedy. Indeed there can be no doubt of its affording a supply of animal fluid of the most perfect kind; that is, a fluid that has no tendency to increase the alkalescency or acescency of the mass of blood and is rather fitted to correct both of these tendencies when they happen to prevail. At the same time, as by its liquidity it passes readily by the excretions, it can hardly give too full a state of the sanguiferous system; and while it carries nourishment enough to obviate too empty a state of the same, we may conclude it to be fitted to give the quantity of fluids the best adjusted to the system.

Whilst milk is thus fitted to give both in quality and quantity the most perfect state of the fluids, if we consider that all foreign matters introduced into, or vitiated fluids generated in, the body, are suited to make a part of the serosity, and thereby to pass off by the excretions, we shall readily find that milk employed for some length of time may not only be a means of correcting, but may also give occasion to the expelling, of every fault that has taken place in the fluids.

This doctrine may be held in general to be very true; but we

must allow that there may be exceptions to it. If the fluids shall have been vitiated by a ferment added to them, as seems to be the case in the lues venerea, and frequently also, as we judge, in cancerous cases, we find that milk may often moderate the violence of the disease, but will by no means cure it, unless some means of correcting and expelling the ferment be at the same time employed. There may be other cases also, in which there may be supposed an acrimony diffused in the fluids, which milk may not be found sufficient to correct, and therefore to cure the disease. In such cases, however, we suppose that the disease does not consist in the acrimony of the fluids alone, but in a faulty state of the general system, or in the functions of some particular parts, which gives occasion to the stagnation and corruption of the fluids; and such seems to be the case in many cutaneous affections which milk does not cure.

There is one disease in which a particular acrimony is supposed to prevail, and there are symptoms of it which support that supposition; but milk does not prove the cure of it. This is the scrophula, which often appears in children living almost entirely upon milk: and in many cases I have been persuaded that it was rather aggravated by the large use of milk in the diet of the persons affected. The disease indeed appears to me to depend upon a certain state of the lymphatic system which we do not understand; but we can say from experience that milk does not seem to have any power in correcting it.

From what has been said, it will be allowed that milk may be a remedy in many and various diseases; but it will be proper here to take particular notice of certain diseases to which milk has been supposed to be particularly appropriated.

The first I shall mention is the phthisis pulmonalis: and how milk is adapted to many cases of this will not be difficult to find. However we may explain the origin of this disease, I would maintain that it never discovers its peculiar symptoms without discovering at the same time a phlogistic diathesis in the whole system. But as milk affords a less quantity of gluten, and a less alkaliescent fluid, than any entirely animal food; so it must be of service in obviating a phlogistic diathesis, and may in time take off the tendency to it entirely. By this means it may moderate, and perhaps cure the disease. These effects may be obviated by milk of any kind; but it will be correspondent with our doctrine to remark, that it will be most effectually obtained by the milk of the non-ruminant animals; and of these by the milk of asses or mares more certainly than by that of women. Possibly there may be cases in which the purpose may be obtained by the use of whey more certainly than by milk of any kind.

It has been a common opinion, that the milk of women is better suited to the purpose than that of any other animal; but I doubt of this, as this milk has a larger proportion of oil in it than

that of asses or mares ; and considering how seldom it is that a quantity of womens' milk sufficient for an adult can be obtained, the use of asses' milk seems to be the more certain practice.

While I thus find the use of milk to be a remedy of phthisis pulmonalis, by its being fitted to obviate and remove a phlogistic diathesis, it may be asked why a nourishment more entirely vegetable might not be still fitter for the purpose? This doubt it is difficult to solve: but to do it as well as I can, I shall observe, that though possibly it may be true that a more entirely vegetable nourishment might be a more certain remedy, and that there are many examples of its success alleged ; yet it may not be always the proper remedy, as there are cases of phthisis pulmonalis, which, though attended with phlogistic diathesis, are at the same time attended with a weakness of the digestive organs with respect to purely vegetable aliments.

It may be also observed, that though a phthisis may be very constantly attended with phlogistic diathesis, it is at the same time often attended with a state of great debility; and it may be dangerous to increase that too much, as a diet purely vegetable might do. But as I have not had an opportunity of determining these matters by any exact and decisive experiments, I must leave it to the judgment of others to determine positively whether a milk diet be universally, or even very generally, the most proper remedy of a phthisis pulmonalis. I must quit the subject with this observation, that it will be difficult to determine universally with regard to this matter ; as it is pretty certain that the cases of phthisis pulmonalis are more varied in their origin and circumstances than physicians have either perceived or explained.

Another disease to which it is alleged that milk is the proper remedy, is the gout. It will not be wondered that disputes have arisen upon this subject, when we consider what different opinions have been maintained with respect to the nature of the disease, and that every difference on this subject may give a different opinion with respect to the propriety of remedies. I shall not here venture to decide between these different opinions, nor enter into any of the disputes that have arisen upon the subject ; but shall deliver the doctrine that appears to me the most probable, and submit it to the judgment of others.

It seems to me that the gout always begins in a plethoric habit, and that it is supported and made ready to recur by the same ; and consequently that if a man never used animal food, he would never have the gout ; and that this is commonly the case, is strongly confirmed by this, that there is hardly an instance of men, who have been reared, and who have lived very entirely upon a milk and vegetable diet, ever having the disease. To this consideration may be joined that of the many instances of men who by accident have been reduced to low living, and been cured of the gout, with which before they had been long afflicted. To

apply this to our present subject, we shall observe, that as milk can never give a plethoric habit, so we believe that a diet consisting chiefly of milk will save a person from ever being attacked with the gout. As we know, however, that in the plethoric habits liable to this disease, a certain degree of vigour and a certain firmness of tone in the whole system, particularly discovered by the state of that in the stomach, is necessary to produce the inflammation of the extremities, the necessary crisis in such habits; so various disorders may be occasioned in such persons by diminishing the vigour and tone of the system. Accordingly it is possible that a milk diet, more especially as a change from one more nourishing, may have that effect: and I am therefore of opinion, that for entirely preventing the gout, it is necessary that a milk diet be entered upon early in life, before the gouty diathesis be formed. But if, after the gout has come on, a milk diet is to be employed for a cure, it must be in persons of entire vigour only; and there are instances of its being employed in such with advantage and safety. In gouty persons, however, advanced in life, and who are liable to a loss of tone, there may be much danger in attempting a milk diet; but at the same time I must say, that as milk is not so weak a diet as one entirely of vegetables, so the former will always be more safe than the latter.

It has been alleged by many, that for preventing or curing the gout, a milk diet for life was necessary, but that employing it strictly for one year was sufficient. It is possible that at a certain period of life it may be so, by taking off the disposition to a plethoric state, which, after a certain period of life, is not ready to return: but this is certainly precarious; for there are many instances of persons who had, for curing the gout taken to a milk or vegetable diet for some time, and after being relieved by it, had returned to a fuller diet; which not only brought back the gout with more violence than before, but occasioned also various disorders in their bodies: and I am persuaded, that after an abstemious course for some time, it can hardly ever be safe to return to a free and full diet.

Several physicians have proposed milk as a remedy in all febrile diseases; and I have already remarked, that a diet of milk without any animal food joined with it, is often used both in obviating and correcting a phlogistic diathesis prevailing in the system, and consequently any febrile state connected with it. But we must now observe, that when a pyrexia or fever is fully formed, the use of entire milk is an ambiguous remedy. In cases of continued fever, I have seldom found entire milk to be a grateful beverage; and it hardly quenches thirst. In most cases, I have observed it to prove disagreeable to the stomach, and often to excite the thirst it was intended to remove. This I have observed in formed fevers of all kinds, whether inflammatory or putrid. In fever, there seems to be in the state of the stomach, somewhat unsuitable

to the proper digestion of milk. Wherein this consists I cannot clearly explain; but from much experience I am certain of the fact. In spite, therefore, of the general and promiscuous commendations above mentioned, I never prescribe entire milk in any case of fever; and more especially as milk in its more liquid and acid states, is more agreeable, and seems to answer better every purpose that can be proposed.

After thus considering the use of milk in general, as alimentary or medicinal, it may be proper to consider what choice is to be made of the different milks that may be employed; and this may be determined very shortly.

Wherever the purpose is to introduce much nourishment, and where there is no hazard of favouring a plethoric state, the milk of the ruminating animals is always to be preferred, provided only that the digestive organs of the patient are quite sufficient for the digestion of it.

Upon the other hand, when the purpose is to obviate and diminish a plethoric state and phlogistic diathesis, it will be most proper to employ the milk of the non-ruminant animals, and especially when at the same time the organs of digestion may be suspected of weakness.

To conclude this subject, it remains for me to say, in what manner entire milk may be most properly employed: And there can be no doubt that for every purpose it will be most proper in its most recent state; and certainly before it has proceeded to that separation of its parts to which it is disposed. Most physicians, and particularly *Dr. Boerhaave*, have supposed that it cannot be exposed for any length of time to the air, without exhaling a volatile and highly valuable portion of it: but no person has been able to give any clear proof of any such exhalations taking place, or to show the nature of it. In the mean time, they have used this argument for supposing it, that it is on this account that, in the principal use of it, the nourishing of infants, nature has appointed it to be drawn from the breasts by sucking; thus providing that it should have no communication with the air till it was taken into the stomach of the young animal. This argument, however, like many others, taken from our judgment of final causes, is fallacious. In the brute creation, we do not perceive that any of them are instructed, or could practise, any other means of drawing milk from the udders of the female, or of communicating it to their offspring, than this of sucking; and though the human species are capable of some artificial means to this purpose, I am well persuaded that it is impossible by any artifice to draw the whole of the milk from the breasts of a woman except by an infant's sucking; and that this is the reason for the institution of nature in this respect, without implying that milk suffers any hurtful change from its being for a short time exposed to the air.

To render it still more clear that milk cannot be hurt by the loss

Of any volatile parts, we are pretty well assured by this, that many nations are in constant practice of giving a certain degree of boiling to their cows' milk immediately after it is drawn from the cow, and this without their finding that the qualities of the milk, for any purpose that it can be applied to, are in any manner injured. On the contrary, they find, that by boiling the milk is less disposed to acescency, probably in consequence of its being by boiling deprived of a considerable quantity of air that might have been favourable to that fermentation.

Another part of our subject yet remains, which is, to ascertain the alimentary or medicinal qualities of the several parts of milk when employed in their separate state; but what we have to observe with regard to this shall be mentioned very shortly.

Butter, or the oily part of milk, has precisely the same qualities as are to be found in the other expressed, or, as they are called, Fat Oils, whether taken from animals or vegetables: and the use of all of them, as employed either in diet or medicine, we shall have occasion to consider in another place. The only question that might particularly occur here is, Whether the oily part of milk is most safely employed in the state of cream, when it is joined with some portion of the caseous and serous parts, or when it is more entirely separated from these in the state of butter. I cannot be positive in answering this question; but it appears to me, that a quantity of oil in the state of cream will be more easily digested than an equal quantity of the oily part in the state of butter. Some difference, however, in this matter may arise from the difference of stomachs more or less disposed to digest oils: and I have known persons who could digest cream better than they could butter. Another difference in this respect may also arise from the stomach being more or less disposed to acidity; and in the more acescent stomach, cream may be more offensive than butter.

The caseous or coagulable part of milk is certainly a great, if not the greatest, part of the nourishment which milk affords; and therefore taken by itself must be considered as a very nourishing matter. Even when taken as produced by spontaneous coagulation, though then very much separated from the oily part, it may be considered as nutritive. But when an artificial coagulation has been practised upon new milk, and when therefore the oily part is joined with the caseous, it must be considered as containing nearly the whole of the nutritious matter of the milk it is taken from; and if the coagulum is taken without the whey being separated from it, it certainly contains the whole, and will be as easily digested as fluid milk taken in. It is therefore a matter of indifference, both with respect to digestion and nourishment, whether milk be taken in its fluid or in its recently coagulated state.

When the coagulum has the whey separated from it, it then becomes a more nutritious substance than the milk it was taken from,

but will probably be of more difficult digestion than either that or the entire coagulum just now spoken of. Whilst, however, the coagulum, from which the whey has been in a great part separated, remains still in a humid state, that is, with a portion of the whey still adhering to it, it will be of more easy digestion than when that humidity is more fully taken away, and the whole mass pressed more closely together is brought into the form of cheese.

Cheese in its dried state is, as we have said above, in very various condition: but its qualities in these different conditions may be readily perceived. When it is made from milk previously deprived of its cream, it may be still a very nutritious matter, but of very difficult digestion, and fit only for the most robust persons: and even the difficulty of digestion may diminish the nourishment which it might otherwise have afforded.

Cheese made of entire milk must be a still more nourishing substance, and I believe of much easier digestion, and cheese made of entire milk, with a portion of cream taken from other milk added to it, will be still more nourishing, and hardly of less easy digestion; as the oily parts every where interposed between the parts of the gluten must render the adhesion of this less firm. As cheese is often made of cream alone, the qualities of this will be readily understood from what has been just now said.

We have likewise mentioned above, that cheese is not always made of cows' milk only, but also of the milk of ewes or goats, and often a portion of the two latter added to cows' milk. In all these cases, as the milk of ewes and goats contains a larger proportion both of the oily and caseous parts; so in proportion as these are employed, the cheese becomes more nutritious, but at the same time of more difficult digestion.

As cheese is employed not only when recent and fresh, but also under various degrees of a certain corruption it is liable to; so by this it acquires new qualities: and according to the degree of corruption, it becomes more acrid and stimulant, partly from the acrimony it has acquired by corruption, and partly by the great number of insects that are very constantly generated in it in that state. In this corrupted condition, cheese can hardly be taken in such quantity as to be considered as alimentary; and in what measure or manner it may be, as is commonly supposed, considered as a condiment influencing the digestion of other food in the stomach, I cannot clearly explain.

With respect to cheese, there is yet one particular to be mentioned, and which is to remark, that it is often eaten after having been toasted, that is, heated over the fire to a considerable degree; whereby a portion of its oil is separated, whilst the other parts are united more closely together. I know many persons who seem to digest this food pretty well; but it is certainly not easily digested by weak stomachs: and for those who can be hurt by indigestion, or heated by a heavy supper, it is a very improper diet.

Many people, especially the poor in mountainous and pasture countries, use milk very much in a coagulated state. There is a particular manner of employing it; which, for aught I know, is peculiar to Scotland, and, as I judge, deserves to be taken notice of.—The preparation of it is as follows. A portion of skimmed milk is put into a wooden vessel, deeper than wide, and which has a hole in its bottom stopped up with a peg, which upon being taken out will allow a liquor to be drawn out of the vessel. This vessel is to be set in another that is wider and deeper, and in which, therefore, the smaller vessel may be surrounded with boiling water. When this is done, the vessels are allowed to remain for one or two days, more or less, according to the state of the weather; after which time the milk is found coagulated, and the watery part separated from the coagulum has subsided to the bottom of the vessel. This acid water is then drawn off by the aperture above mentioned; and the small vessel being again stopped up, it is again set in the larger vessel, to be surrounded with boiling water as before. After matters have remained in this state for twenty-four hours longer, it is found that more of an acid water has been separated from the coagulum; and this water being drawn off as before, the coagulum, now of a pretty thick consistence, is stirred and agitated pretty briskly by a wooden stick; and in this condition it is presented upon our tables.

This dish, during the whole of the summer in Scotland, is often used by the middling rank of people, and is well known at Edinburgh under the name of Corstorphin Cream, and is denominated from the neighbouring village, in which it is especially prepared. It is brought to market in all the considerable towns of Scotland. It is an aliment tolerably nourishing; and by the quantity of acid still retained in it is moderately, but gratefully, acid and cooling. I have frequently prescribed it to phthysical patients; and neither in these, nor in any other persons, have I known any disorders of the stomach or intestines arising from the free use of it.

After having thus considered every thing relating to the caseous part of milk, there remains to be considered what we marked above as a third part in the composition of all milk, and which is its watery part.

This we shall consider first as in the state of *butter-milk* produced in the manner above described. This is commonly procured from milk after it has been kept for some time, and has become more or less acid: but it may be procured from very recent milk; and in this case the butter-milk is not acid, and only differs from entire milk by the oily part being taken away. In this state it is still tolerably nourishing; and being often more easily digested than entire milk, I have frequently employed it in phthysical cases with more advantage than I could do either the entire milk or the watery parts of it in a more acid state. It is in this last state, however, that it is most commonly employed; and it is highly

useful in all cases where the refrigerant powers of milk are required. As the longer it has been kept it seems to have its acidity increased, so it proves more powerfully refrigerant. Some have imagined that in certain cases it might be dangerous: but unless when drank in very large quantity, or when the body is very warm, I have not perceived its bad effects; and in the last case, it is probable that cold water would have done the same mischief. With respect to the acid of butter-milk, or other acid states of the watery part of milk, it is worth observing, that such acid does not increase the acescency of the stomach, or occasion the flatulency that recent vegetable acids and acescents commonly do; and therefore it is employed more safely than these for dyspeptic persons.

The state in which the watery part of milk is chiefly employed, is that of *whey*, strictly so called. As this is separated from entire milk, and from a coagulum produced by runnet; so, besides a saccharine matter, it always contains a portion of the oily and caseous parts, and in consequence is a nutritious fluid. It is, however still less so than entire milk; and therefore when a plethoric or phlogistic state of the fluids is to be obviated or corrected, it seems to be fitter for the purpose than any entire milk, though it may be doubtful if the whey of the milk of ruminant animals may not be as nutritious as the entire milk of the non-ruminants.

Whey, however, is chiefly to be considered on account of its peculiar ingredient of sugar; which, by its being afforded by this and so many other alimentary substances, must be considered as of the most salutary nature with respect to the human œconomy. It is by this, or by the acid which it is changed into, that it must be considered as peculiarly suited to obviate the phlogistic and too alkaliescent state of the human fluids: and as whey can be commonly taken in greater quantity than any entire milk, it may in many cases of disease be a more effectual remedy. It is only upon this supposition of its being introduced in larger proportion, that I can understand the so-much-commended virtues of the *sugar of milk*; for when this is purified to a certain degree, I cannot perceive that it differs from the sugar obtained from the sugar-cane or other substances; and when employed in its impure state, I cannot conceive that much virtue can be supposed to be given to it by the small portion of the other parts of milk which may be adhering to it.

Hitherto we have considered whey as taken in before it has undergone any acescent fermentation; but it is frequently taken in its acid state, as a part of, or along with, alimentary substances: and in this state must be viewed as less nutritious, and chiefly as an acid only useful for the purposes above mentioned. It is now, however, to be observed with respect to the qualities of whey, that from its disposition to acescency in certain stomachs, it may suffer this change to a noxious degree, and show the flatulency and other circumstances attending the cases of morbid acescency. It

is by the same saccharine quality that it proves a laxative; but whether this depends upon its retaining its entire saccharine state, and in that state stimulating the intestines, or that it depends upon the acid produced from it mixed with the bile, we shall have occasion to consider in another place.

ARTICLE II. *Of Animal Food, strictly so called; that is, Food consisting of the whole, or of part, of the Substance of Animals.*

THE solid and fluid parts of the mammalia are so nearly of the same nature with one another, that the fitness of all of them for nourishing any of the other who live on animal food, and therefore the fitness more or less of all of them for nourishing the human species, can hardly be doubted of, and is very well established by much experience. In considering, therefore, the mammalia as affording aliment to man, we have only to examine the greater or less fitness of the several orders, genera, and species, for that purpose. This we shall do, in the first place, by considering those qualities of animal food, by which it is more or less fitted to be an aliment to man; and afterwards we shall enquire how far these qualities are to be found in the particular species of animals commonly employed for this purpose.

That quality of animal substances fitting them to be aliments, which first deserves to be mentioned, seems to me to be the degree of solubility in the human stomach. The solution of food in the stomach may be assisted by manducation; but certainly depends for the most part upon the power of what is commonly called the gastric juice, which nature has provided as a solvent to a certain degree of the several solid or consistent matters taken down into the stomach.

This solvent, however, as we have observed above, is of greater or less power in different animals; and so it seems to be in the different individuals of the human kind. How far this may depend upon different states of the gastric fluid in different men, we have not yet been able to discern; but in all of them it seems to be materially different, according to certain conditions in the aliments taken in, and particularly from these giving it a different degree of solubility; and which are therefore to be especially investigated.

The condition especially giving more or less of solubility, is the different firmness of texture which appears in animal substances: and this again is different in the different species of animals according as these are either very entirely carnivorous or phytivorous; the substance of the former being more dense than that of the latter. This, joined with some other considerations, explains why the former are hardly ever, and the latter so generally, employed as aliments to man. It may be supposed that this difference in the density of the substance depends upon the nature of the aliment which these different sets of animals employ; and

therefore that even those who employ a food partly animal and partly vegetable, should be of a more dense substance than those who live entirely upon vegetables. This, however, does not appear to be strictly the case; for the substance of the bull is more dense than that of the dog.

2dly, In the phytivorous animals the density of the substance is different in the different genera and species by an institution of nature, of which the cause cannot be assigned; but the fact is very evident, as the density of beef is *ceteris paribus* always greater than that of mutton.

3dly, In the same species the density is different according to the sex; the substance of the male being always more dense than that of the female. In the male sex, however, castration at an early period of life makes a considerable change; as it prevents the animal from acquiring the same density of substance which it would have acquired had the genitals remained entire. Castration has also the effect of disposing the animal to grow fat, which, as we shall say presently, has an effect in rendering meat more soluble.

4thly, In the same species the density of its substance is different according to the age of the animal; and as the density of every animal is always increasing as the animal advances in life, so young meat is universally more soluble than old: and this goes so far, that in many species we employ only the young, and hardly ever the older animals in diet. There is, however, a difficulty which occurs here. Although from their texture young meats are more soluble than old, and appear to be so in decoctions with water, yet in some stomachs the young meats are more slowly digested than the old; and thus in some persons veal is more slowly digested than beef, and lamb than mutton. Indeed *Dr. Brian Robinson* has given us this singular fact, that in one person he found chicken to be more slowly dissolved than any other animal food. What this is owing to, is difficult to determine. Whether in certain stomachs very much disposed to acescency, the solution of animal meats may not be delayed by that acescency, and that in such stomachs the most alkaliescent foods will be most easily digested? And as we shall say in the sequel that the older meats are more alkaliescent than the younger, this may perhaps account for the difference mentioned, that sometimes occurs in the digestion of them. We are disposed to think that it does so, because it is observed that the difficult digestion of young meats happens especially in the most acescent stomachs.

Another cause of the difference of digestion mentioned may in some cases be the more gelatinous nature of young meats than of old: and this seems to have a share; for I find the jellies of all animal substances, though extracted from old animals, to putrify more slowly, and with more previous acescency, than the recent juices of animals. It may not be improper to observe also here,

that in acescent stomachs, liquid aliments, though extracted from animal substances, are more difficultly digested than solid meats. Does not this happen from the liquidity favouring acescency?

5thly, In animals of the same species, sex, and age, the flesh of individuals is of greater or less density as they are fatter or leaner. In lean animals, the fibres of which their flesh is composed are more closely compacted together, while in fatter animals these fibres are more separated by a cellular texture filled with oil; and the flesh of the latter, therefore, is not only rendered more soluble by the laxity of its texture, but also as we judge by the quantity of oil which enters into the substance of the fibres.

Sometimes, however, it happens, that fat meats are of more difficult digestion than those that are leaner: but this arises from the fat in those meats being collected in masses separate from the fleshy fibres; and in such cases the difficulty of digestion arises from the difficulty of digesting a large proportion of oil; with respect to which, indeed, we shall say hereafter, the power of different stomachs is very different,

6thly, In the same animal the solubility is different in the different parts of it. Of the fleshy parts connected by a looser cellular texture, the solution readily takes place; whereas of the membranous parts in the tendons and ligaments, in which that texture is more closely compacted, the solution is more difficult.

7thly, In meats in other respects of the same qualities, their solubility is greater according as they happen to be further advanced towards putrefaction. It is well known that putrefaction to a certain degree destroys the cohesion of all animal substances; and the tendency to this, if it be not prevented by the want of air, by cold, or antiseptics, applied, begins as soon as the animal dies. It is for this reason that meats recently killed are not so soluble as those that have been kept for some time. There is, however, a period in the progress of putrefaction, at which meats become unfit for the human æconomy: but it is difficult to determine the limits of this; for there are certain stomachs to which meats when any approach to putrefaction is discoverable in them either by their taste or smell, are highly offensive; while there are many stomachs in which meats highly tainted are readily digested; and perhaps more readily than fresher meat.

8thly, Not only are animal substances more soluble as they are more advanced towards putrefaction, but they seem also to be so according as they are more disposed to suffer that change, or, as I would otherwise express it, as they are more alkaliescent.

It is very probable that this is not only different in different animals, but also in individuals at different times; although we find it difficult to distinguish the different degrees of it, or to assign the causes of these. In many cases it seems to depend upon an institution of nature, giving more of this quality to one genus or species of animal than to another, without our being able clearly to

explain the causes of this: but the natural constitution of the animal being given, we can often mark the circumstances which increase or diminish this quality and disposition in individuals; and it will certainly be of use to ascertain these as well as we can. The state of it seems to be according to the age of the animal, according to the diet it lives upon, and particularly according to its habits of more or less exercise.

As an alkalescency is the peculiar disposition of the animal œconomy, so it is probable that this increases as life advances: and as we have given above some reasons for believing young meats to be less alkalescent than old, so there are several marks of the fluids becoming more acrid as life advances; and therefore that the alkalescency of animal substances may be in general according to the age of the animal.

With respect to diet, there can be little doubt that the alkalescency of the animal fluids will be greater or less according to the difference of food on which the animal lives; and accordingly that it is manifestly greater in the entirely carnivorous, than it is in the entirely phytivorous, animals: and this, as I have said before, we take to be the reason or instinct determining the former to be so rarely, and the latter so commonly, the food of mankind. With respect to those animals that live sometimes on a vegetable and sometimes on an animal diet, we have a clear illustration in the experiments of *Dr. Young* on bitches, serving to show the influence of animal food in giving alkalescency to the animal fluids.

Of the quadruped kind there are none employed in the diet of this country which give us an opportunity of marking the effects of such a difference of diet; but probably some difference might arise from their living upon grain, or more entirely upon grass: and in the bird-kind there is probably a considerable difference from the bird's living more upon animal food or more upon vegetables; as we shall more particularly take notice of in the sequel.

Lastly, The alkalescency of animal food seems to depend upon the animal's being more or less in the habits of exercise. As it is sufficiently probable that the alkalescency of the animal fluids is in some measure produced, and always increased, by the activity of the circulation: and as this therefore is greatly increased by exercise, so it is probable that animals, the more they are in the habits of exercise, will have their fluids in a more alkalescent state: and this is confirmed by every other means we have of judging of this matter; as we shall say more particularly hereafter.

To conclude this subject, it may be supposed, that the alkalescency of the different animal substances might be determined by the different proportion of volatile alkali, which might be obtained from them by distillation: but to this purpose few or no experi-

ments have been made on the different alimentary substances; and although it is probable that some difference might be found, yet from several trials made by us, the difference is so inconsiderable, that it will be difficult to ascertain it with much precision, and therefore to apply it to the present subject.

Besides considering animal aliments by the difference of their solubility, as we have done, they may also be considered by their being more or less perspirable. *Sanctorius's* account of mutton, and *Keill's* account of oysters, might lead to an opinion, that the difference in this respect is considerable; but *De Gorter* found neither the one nor the other fact confirmed by his experiments. It is, however, still highly probable that aliments, and even animal aliments, are different in this respect; and the matter deserves to be examined by experiment. I am indeed very much surprised that more observations on this subject had not occurred to *Sanctorius*, and other persons who have been engaged in experiments upon perspiration. But I must own from the experiments I have myself made, that the difference is commonly so inconsiderable, and so many other circumstances may at the same time concur to vary the state of perspiration, that it will be always difficult to determine what depends upon the aliment alone.—In the mean time, I would reason in this manner: As they are the alkaliescent parts of the animal fluids that form the excretions, we are persuaded that *ceteris paribus* the different animal aliments will be perspirable in proportion to their alkaliescency, as determined above: and so far as experiments in this way can be trusted, our opinion is confirmed by experiment; and particularly that the old, or, as I call them, the more saline, meats, are more readily perspired than the young and gelatinous.

The last consideration I have to offer with respect to the aliments taken from quadrupeds, is, that they differ according to the quantity of nourishment they severally contain; which, however, we find to be a matter difficult to determine. It might be supposed that it would be according to the quantity of soluble matter, and therefore of the extracts obtained by the solutions which we practise out of the body: but this we cannot readily admit of, when we consider and believe that the gastric juice can dissolve the whole of the substance of the several aliments more entirely, certainly more quickly, than can be done by any application of boiling water; and therefore we are of opinion that the quantity of nourishment in the several aliments we are considering, is to be estimated by the quantity of animal matter in each of the several kinds that is soluble by the gastric juice, and will therefore be according to their respective densities.

We have supposed that the aliments will be more or less quickly dissolved by the gastric juice according to the degrees of solubility in each, as determined by the circumstances above mentioned; but whether there are any limits set to the powers of the gastric

juice, with respect to its more or less complete solution of all the parts of the substance which it anywise dissolves, we cannot positively determine. The gastric juice of the human stomach does not dissolve the bones or cartilages of animals; and perhaps it dissolves the more firm and membranous parts less completely than it does the fleshy; and it seems to be the latter only which it dissolves very entirely. Whether it makes any decomposition even of these, as decoction in water does, and therefore leaves some portion of their earthy parts undissolved, I would not positively determine: but such a decomposition seems to me very improbable; and therefore would conclude as above, that the quantity of nourishment in any meat which the gastric juice entirely dissolves, is in proportion to the quantity of animal matter which it contains. Upon this ground I would conclude, that in equal weights of beef and veal, notwithstanding what appears in their decoctions, there is more nourishment in the former than in the latter; and our experience in the feeding of animals who take in such food, is certainly in confirmation of this. What difference may arise from the more alkalescent and perspirable state of the one, and from the more gelatinous and less perspirable state of the other, I leave to further consideration.

To conclude the general consideration of aliments taken from quadrupeds, I must say a little of their effects in general on the human constitution.

The first effect to be taken notice of, is their giving, in the same proportion taken in, more nourishment than any vegetable aliments do. The latter can afford, as we have said, the whole juices of an animal body, but certainly not in proportion to the quantity of them taken in; whilst animal substances that can be entirely dissolved in the gastric juice seem in proportion to that quantity to be entirely convertible, as the expression is, *in succum et sanguinem*. If at the same time they are in the smallest quantity less perspired, they must greatly increase the plethoric state of the blood-vessels. Animal food, therefore, is always ready to induce this state; and in growing bodies, such food will always favour, and probably hasten, the growth: and although in adults, exercise and other means, by supporting the excretions, may prevent its having this effect, yet it will always have a tendency to produce a plethora ad volumen. Moreover, as animal aliments for the most part introduce a greater proportion of oily matter, they are ready to occasion a larger secretion of oil into the adipose membrane, and thereby produce obesity; which, when considerable, must straiten the sanguiferous vessels, and consequently produce a plethora and spatium.

Animal food having thus a considerable tendency to fill the blood-vessels, so it must support the constant tension of these, and thereby in my opinion give a greater degree of strength to the whole body; and from the doctrines laid down above on the sub-

ject of irritability, it will also readily appear, that animal food is likely to increase the irritability of the system.

It deserves to be particularly attended to, that as the balance between the several parts of the system may not always be exact, so the plethoric state may be greater in one part than in the other; and thus if it happens to give a greater tension to the vessels of the brain, it may dispose to epilepsy; or if it happens to give an increased tension to the vessels of the lungs, it may dispose to asthma. More particularly, if it be considered, that in all full systems, the lungs must always be most exquisitely filled; and that nature has provided that the vessels of the brain should always have a due degree of tension: so it will be readily understood why these two parts of the system must always be readily affected by every unusual fulness of the sanguiferous system, and from the general irritability at the same time induced, may give occasion to many particular diseases.

It is also to be observed, that when animal food gives a general fulness of the blood-vessels, if the balance between the arteries and veins be not exactly adjusted, an undue proportion may take place; and if more than usual is retained in the arteries, it may give occasion to arterial hemorrhagy; or, if a greater quantity of blood than usual is thrown upon the veins, it may produce an overcharge either in the system of the vena portarum, or in the venous system of the head; and what consequences may arise from either of these circumstances, I need not explain.

Some of our readers may perhaps judge, that a great part of what I have now said might have been left to be understood from the general doctrine of Plethora: but both because I think that general doctrine has not been always well understood, and because it was my business to explain the effects of animal food, I thought it necessary to show that its effects are especially to give a nicer balance in several respects to the system, and thereby give a disposition to many diseases which might be avoided by a more temperate use of such food. It deserves also to be remarked, that though a proper measure of such aliment, with an exercise suitable to it, may render it long consistent with health; yet as the constant use of it gives a nicer balance to the several parts of the system, so every unusually large indulgence in it must be extremely dangerous.

This leads me to take notice of what perhaps I should have begun with; that is, to mention the effects of animal food, as it is immediately taken into the stomach: but I still think it will be more proper after what I have said.

We are of opinion, that every kind of food taken into the stomach, as soon as it sets this organ to work, increases the action of the heart, and occasions a frequency of pulse; and if we mistake not, by the energy of the brain's being thus directed to the heart and stomach, a torpor in the animal functions, both of sense and

motion, is induced, and often to a degree of sleepiness. These are the effects of food soon after it is taken into the stomach: and it seems also manifest, that these effects are more considerable from animal than from vegetable food. It seems also equally manifest, that the feverish state during digestion is in proportion to the alkalescency of the animal food taken in, and that the degree of torpor induced, and the continuance of the feverish state is more or less according to the quantity of food taken in, and according to its being more or less readily soluble by the gastric juice.

From these considerations, the whole phenomena of digestion, with respect to the system, may be explained; and, upon the whole, that although animal food may be admissible by the human æconomy—and in certain circumstances of that it may be proper and even necessary—and therefore, that in many cases, it may be consistent with health; yet that for the most part, a small portion of it only is necessary; that the very temperate and sparing use of it is the surest means of preserving health, and obtaining long life; whilst the large use of it tends to the production of diseases, and to the aggravation of those that from other causes may incidentally come on.

We are much disposed to remark, that the opinion of an ancient writer, though not *Hippocrates*, was well founded. He asserts, that the best means for preserving health is *nunquam satiari cibis, et impigrum esse ad labores*; and we believe that this was meant especially with respect to animal food. We must also observe, that an otherwise sage ancient, has in our opinion given a rule of the most pernicious kind. When *Celsus* says, with regard to eating, *Modo minus, modo plus justo assumere*, the rule may be allowed; but when he says, *Et semper plus dummodo hunc concoquat*, he gives a very fallacious test of what is safe, and, in general, a very dangerous rule.

Before I leave the subject of animal food in general, I must touch a question that I think especially relates to it; and that is whether sleeping after a full meal be suitable to the health of the human æconomy? If we are to trust to the institution of nature in the brute creation, and suppose that their instincts are generally suited to the health of their æconomy, it would appear that sleep after eating is suited to favour their digestion: but whether they may be suited to the human æconomy may be doubtful. The propensity to sleep after eating is commonly the same in man as in brutes; and I am persuaded that, in elderly persons after a mid-day meal, it may in some degree, be indulged; but I am equally persuaded from my observation and experience, that a full supper, immediately before going to bed, is generally hurtful. Whether this happens in those persons especially who take two meals of animal food every day, or that a long sleep after such a meal, during which, not only the animal, but also the natural and vital func-

tions should have a great deal of rest, is the cause of the bad consequences which often follow, we cannot positively determine.

The solution of this and many such questions is much embarrassed by this, that errors in the conduct of what relates to health, when moderate in their degree, do not immediately show their effects; and only after a long time, in consequence of frequent repetition, when from our gross ignorance of the animal economy, we do not perceive and readily mistake the cause of the disease then arising.

Having thus considered the qualities of the aliments taken from quadrupeds in general, we must next endeavour to say which of those qualities prevail, and how they are diversified in the several genera and species.

The first on our list is the *Bos* or *Ox* kind. The flesh of this is the most dense of all the quadrupeds; and how far that density goes in preventing solubility, we have an instance in the bull, whose flesh is seldom chosen as a part of our diet. The flesh of the female sex is of a much more soluble nature, and sufficiently fit for nourishment; but we commonly prefer the castrated ox, in which the fat is better mixed, and as more alkaliescent, the flesh is more sapid; and, unless it be from a very old animal, is generally to be preferred.

The chief difference of aliment in the ox kind, is that which appears between the old and young; the flesh of which last is named *Veal*. This, as less dense, appears in our decoctions to be more soluble; and in consequence of this, gives more of a gelatinous extract than the flesh of the adult; but it is not therefore, more nutritious; as the gastric juice dissolves more than the water in our decoctions.—In young animals, the softer texture depends upon there being little difference between the muscular fibres and the cellular texture interposed between them. But this state is limited to a certain period of their growth. In veal it is when they are under two months old; for after that, and sometimes before it, the muscular fibre becomes more distinguishable, and the whole substance becomes less tender. Why veal gives a more gelatinous decoction than the older animal, we shall endeavour to explain hereafter.

Ovis, or the *Sheep* kind. These afford a dense substance, but less so than that of the ox kind. The difference of sex has the same effects here as in the ox kind; and more clearly here the flesh of the castrated animal is universally preferred. In this species, a circumstance to be taken notice of more than in any other, is, that the meat of this animal is more sapid, and seemingly more easily digested at a certain advanced period of life, than when it is younger. Mutton under two years old, is less sapid and more difficultly digested than when it is several years older; and it seems to be in its greatest perfection at the age of five. This we ascribe in part to its alkaliescency, greater at that period

than when it is younger; but especially to the proportion in which the cellular texture filled with oil is to the solid fibres between which it is interposed. How far these circumstances take place, as some suppose at a period of life still more advanced, we cannot determine; but are persuaded it must have its limits, as the density of the solid increasing as life advances, may, at a certain period very much diminish its solubility.

With regard to the Sheep kind, I hold that the same difference takes place between the young and old; that is between *Lamb* and a full grown Sheep, as in the cow kind between veal and beef. With respect to *Lamb*, there is a particular management that may take place. If the lamb is allowed to suck its mother for six months or a little more, it becomes an aliment more nourishing and digestible than that of a lamb of the same age that had been weaned as usual at two months old.

Capra, or the *Goat* kind, is more dense and insoluble than that of the sheep, partly from its nature, and partly from its food and exercise; so that even the flesh of the castrated kind is seldom admitted where any delicacy of aliment is studied.

Sus, the *Sow* kind. The peculiarity of the aliment taken from this genus consists in the quantity of oily matter which is here accumulated in the adipose membrane separately from the muscular parts, and that in greater proportion than in any other of the quadrupeds we employ in diet.

We have said above, that the oil of animals enters for a great part into the composition of the animal fluid, and is therefore a directly nutritious matter, and is further necessary for many purposes of the animal æconomy, to be laid up in the adipose membranes of the human species. We hold it, therefore, for certain, that the flesh of quadrupeds is a more nutritious, and a more proper aliment, as it contains a greater portion of oily matter, provided only that this is no more than the digestive organs can properly assimilate. In this respect we find the digestive powers, as observed above, to be very different in different persons. In some, the power of assimilating oily matter is very great; while in others it is extremely limited; and frequently in the same persons it is different at different times.

Whether from want of habit, from accidentally excited aversion, or from peculiarity of constitution, it is, that many persons of Scotland do not admit of pork or bacon in their diet, or digest it easily, I do not know: but certainly they are in greater number than in our neighbouring country of England. In those who do admit of it, it proves an easily digested and very nourishing food.

In this species there is the same difference as in others between the flesh of the young and of the adult animal: and here the difference turns upon the flesh of the pig or young animal being always less fat than that of the adult; and is therefore more digestible to many persons who cannot digest the flesh of the adult. As in other spe-

cies also, there is some difference from the sex; and the same difference in the castrated male and one that is entire: but it appears that these differences are less considerable than in any of the other species of quadrupeds. It is to be remarked also, that this species affords a food prepared in a manner that cannot be applied to any other; this is what is called *Brawn*; a substance not readily soluble; but, in such stomachs as can dissolve it, affording a great deal of nourishment. What is properly the Brawn, seems to consist chiefly of the adipose membrane closely compressed; so that much of the oil is squeezed out, while the cellular texture remains so closely united as to form a transparent substance.

Cervus, the *Venison* kind; for to this genus the term Venison is most properly and strictly applied. There are three species employed in the food of this country; viz. the Stag, the Fallow Deer, and the Roe. They are all wild animals and much exercised: they are, therefore, alkaliescent; and though of a dense substance, yet at a proper period of their age, and being of tolerable fatness, they are sufficiently soluble and nourishing.

The *Stag* kind, as much exercised, are of the most dense substance, and perhaps most alkaliescent; and therefore most sapid to many persons; but as the fallow deer are most commonly better fattened, they afford a more soluble meat.

The *Roebuck* in its flesh seems to be of the tenderest substance; but as more rarely of much fatness, is perhaps less readily soluble.

Lepus, the *Hare*. As this animal is wild and much exercised, its flesh is dense and not easily soluble; but from its nature and exercise it is an alkaliescent food, and is therefore more easily digested, and proves tolerably nourishing. As it is an object of chase, and often only killed after long exercise, it is therefore often much deprived of the oil that should be in its cellular texture; and is then more difficultly digested than when it is suddenly killed.

Cuniculus, the *Rabbit*; a species of the same genus with the hare, but by nature, and from its being little exercised, it is of a very different quality; still however of such a dense substance that we hardly ever employ the adult or older animal. The young are of a tender and white substance, and afford an aliment very readily digestible, and considerably nourishing.

The mention of the white flesh of the rabbit leads me to take notice of what perhaps I should have spoken of before; the difference between the white and red meats, which was long ago marked by *Dr. Cheyne*. This difference certainly depends upon the greater number of red arteries, and therefore upon the larger quantity of red globules interposed between the muscular fibres in the one case than in the other. As it is probable that the red globules of the blood are considerably alkaliescent, it will follow, that the red flesh is more alkaliescent than the white, agreeable to what

we have said above, that the substance of young animals, in which the white flesh is especially found, is less alkalescent than that of the old. It is properly, therefore, that the white meats are considered as less irritating than those of a red colour; abstracting however, from the effects in the stomach that may happen from their gelatinous nature spoken of above.

What consideration from the quantity of red globules present in a portion of meat may arise with respect to the nourishment it may afford, is not easily determined: but we are persuaded it may be a reason for supposing it to be greater in red meats than in white; and therefore a further reason for its being greater in old meats than in young.

I have now spoken of the quadrupeds employed as aliments in this country; and of those of other countries I have omitted to speak, both because I have not experience enough to enable me to speak of their particular qualities, and because I expect the principles I have laid down with respect to those I have treated of, may be applied to the state of other animals, by any persons who are acquainted more exactly with their nature and circumstances. —There are certain general questions relative to the aliments taken from quadrupeds, particularly with respect to their preparation; but as the same questions relate to the other hot-blooded animals that we are yet to treat of, I shall delay the consideration of these questions till I have considered the other set of hot-blooded animals, the Birds.

§ II. Of ALIMENTS taken from BIRDS.

The birds, like the quadrupeds, have two ventricles of the heart, and have a blood of nearly the same temperature with that of quadrupeds; and their flesh, or their parts which we employ as aliments are nearly of the same qualities as those of the quadrupeds I have treated of: And therefore the general doctrine we have given with respect to the solubility, alkalescency, and nutritious quality, of those, need not be repeated here; and it only remains for us to say, in what manner the aliment taken from the several genera and species of birds may be distinguished.

Of the class of birds, according to the Linnæan system, there are six orders; *Accipitres*, *Pica*, *Gallina*, *Anseres*, *Grallæ*, and *Passeres*. From the two first, as generally carnivorous animals, hardly any of our aliments are taken; but from the four other orders a great number are employed; and we shall say a little of the particulars.—I begin with the order of *Gallina*, from which the greatest number of aliments are taken.

The species most frequently employed is the *Gallus*, *Gallinaceus*, the Cock and Hen more strictly so called, or our common dung-hill-fowl. Making allowance for the difference of age, the flesh of this species being always white, is the most tender and the least alkalescent, and therefore among the least stimulant of animal

food. On this account, the *chicken*, or the young of this species, is most commonly allowed, when we are afraid of the irritation of animal food; and upon the general principle of the young of every species being the most soluble and least alkaliescent, the practice seems to be well founded. But as I observed above, in the instance of veal, that the flesh of young animals is sometimes more difficultly digested than that of the old, so the fact given us by *Dr. Bryan Robinson* is an instance of it in the case of chicken: and though this cannot be supposed to be a common case, yet I think I have met with some other instances of it.

In this species, the difference depending on age is sufficiently remarkable; so that after a year old, the fowls of this species, according to the advancement of their age, are constantly becoming proportionably more difficultly soluble. Before a year old, the difference arising from sex is not very remarkable: but after that period it becomes more and more considerable. In this species also, the effects of castration are more and more considerable; and the *capon* and *poulard* become readily fatter, and retain their tenderness much longer, than the cock or hen whose genitals are entire. In preparing this species for our tables, a difference of management often takes place: and though the barn-door fowl, as it is called, is certainly an unexceptionable aliment, yet it appears to me that a crammed fowl, as it is more alkaliescent, so it is more sapid and tender: and for what I can perceive, a sufficiently innocent food. Of this species, many varieties are marked: but they appear to differ only in their external form, and I have not yet found that they give any difference of aliment.

Very much of the same nature with the species we have been speaking of, is the *Numida*, Linn. or *Guinea-Hen*; and this taken at a certain age, affords an aliment as tender and as little alkaliescent as the species last mentioned.

We are much disposed to say the same of the *Gallo Pavo*, or *Turkey*; and if any difference is to be assigned, it is very little, and perhaps only in its being somewhat less soluble and more alkaliescent.

The only other domestic fowl belonging to this head, is the *Pavo*, or *Peacock*; and this, taken in whatever state, is to a considerable degree less soluble than any of the preceding species. Although vanity might have formerly set it upon the Roman tables, it is hardly ever, except in its very youngest state, admitted to the tables of modern Europe.

These are the domestic species of the gallinaceous order. Of the wild kind, the first to be mentioned is the *Pheasant*; which from its nature and greater exercise, is less soluble than any of the domestic fowl: and though from the same causes, it is more alkaliescent, this does not render it, except in its very young state, very readily digestible.

Next to the pheasant, I put the *Partridge* and *Quail* kind. Of the former there is a great variety; but how far they differ as aliments, I am not exactly informed. I am, however, persuaded that it is not in any considerable degree. The partridge of this country is of a much tenderer substance than the pheasant: and though also less alkaliescent than that, it is from its exercise more so than the domestic fowl. From thence its qualities as an aliment may be readily understood, as may also those of the Quail, which are very nearly the same.—The partridge and quail are put by *Linnaeus* under the genus of *Tetrao*: and agreeable to the rules of natural history, they may be so placed; but certainly with a view to their qualities as aliments, they may be properly distinguished.

The *Tetrao Urogallus*, and the other *Tetraones* pedibus hirsutis, are of different qualities from those of the partridge kind, or the *Tetraones* pedibus nudis.—Of the *Tetraones* pedibus hirsutis we have four species in Scotland. The *Cock of the Mountain*, a species formerly frequent in this country under the name of the *Capercaillie*, is now almost entirely lost. The other three species are, the *Black Cock*, or the *Tetrao Tetrix* cauda plena: the third is the *Red Game*, not known to *Linnaeus*, and is, I think, the *Atagas* of *Buffon*: and the fourth is the *Ptarmigan*, which I take to be the *Tetrao lagopus* of *Linnaeus* and the *Gelinotte d' Ecosse* of *Mr. Buffon*.

All these species seem to have a common quality. The three first are naturally of a tender substance; and they are still more so from their alkaliescence, which is considerable. From both circumstances, they are sapid and agreeable to most persons; but at the same time must be considered as a considerably stimulant food. The *Ptarmigan* is a drier food, less tender and less sapid than the other three species.

A second order of the birds affording aliments is that of the *Anseres*, or the *Water-fowl*.

The most noted for its bulk and figure is the *Cygnus* or *Swan*; but its flesh is firm and solid, and of so difficult solution and digestion that it is little employed as a food.

The *Anser domesticus*, or *Tame Goose*, is of qualities approaching to that of the swan; but as less exercised, and living much on vegetable aliment, is of a more tender substance: but was it not for its alkaliescency, it would be still a substance of difficult digestion.

Upon this account the *Anas Domestica*, as living more upon animal food, is still more alkaliescent and of more easy solution. Of both these species, the young animals, of a more viscid texture, are more slowly digested than those somewhat more advanced. Of each species, there is a tame and a wild kind; and the latter, as of more alkaliescency, are more easily digested than the others.

Of this anserine tribe there are a great number, besides those enumerated, that afford aliment, and are much of the same qua-

lities with those already mentioned. With respect to most of them, as they are sea-birds and live upon fishes, they are more alkaliescent, and very often on that account are tender and of easy digestion. They are commonly of a strong odour, and of a rank fishy taste, and from thence to many persons highly disagreeable: but to others, to whom their odour is not so offensive, their sapid and tender flesh is highly agreeable, and generally proves of very easy digestion. These circumstances are particularly applicable to the peculiar Scottish food, the *Solan Goose*; which to many indeed, even of this country, is highly offensive and entirely rejected; whilst to many others it is in the highest degree of favour.

The next order of birds to be taken notice of is that of the *Grallæ*, which comprehends a great number of species of very different qualities; and I cannot find that any one quality can be found in common to the whole order. As they are birds of more or less exercise, they are accordingly of a firmer and less soluble substance: and as many of them are sea-birds, living very entirely upon fishes, they are considerably alkaliescent, and in their flavour and taste come near to the nature of the anserine kinds, who resort to the same places and live upon the same diet.

The effect of exercise on the particular parts of an animal appears in birds of this tribe, the *Woodcock* and *Snipe*, in which the muscles of the breast, much exercised in flying, are of a firm and less soluble texture; while the legs, little exercised, are more tender.

We are now come to speak of the fourth order of birds affording aliments, which is that of the *Passeres*; a very numerous tribe, to which as alimentary we can assign no common quality: and we have too little experience of particulars to distinguish the variety that may occur here.

There is one genus among those most frequently used, that seems to have peculiar qualities different from most of the other *passeres*. This is the *Columba*; a genus, of which several species might, I believe, be used if we could obtain them in their young state; but we are only well acquainted with what is in common use, the *columba domestica*. We take this in its very young state, before it has had any exercise, and in which state only it is sufficiently tender. But nature, independent of food or exercise, has made it of a very alkaliescent quality, from whence it is tender; and even in its youngest state, from the same quality, it is a heating food.

Of the other *passeres* I can only say, that almost all of them, when they are taken in their fattened state, are sufficiently tender and easily digested; and according to their diet on grain or worms, are more or less alkaliescent.

I have thus finished what I had to say of aliments taken from the class of birds; and must here take notice of a very particular

kind of aliment afforded, and only afforded, by this class ; and that is *Eggs*. As the substance of these is what affords a matter peculiarly suited to the formation of the young animal, it must be considered as containing a large proportion of nutritious matter : so any quantity of it, taken into an animal body must be supposed to introduce a large proportion of such matter.

This we might suppose to require no preparation in the adult body it is taken into, to fit it for the purpose of nourishment : but this does not happen to be the case ; for we, for the most part, take into the human stomach the white of egg in its coagulated state ; and even when taken in in its liquid state, the first change that happens to it there is its being coagulated : so that in all cases it must be again dissolved by the peculiar power of the gastric juice, probably for the purpose of its being mixed with other matters necessary to constitute the proper animal fluid.

Digestion is a mysterious business, which we do not, in all its circumstances, well understand ; and therefore we cannot at all explain the singular fact of the white of egg even in very small quantity, whether in its liquid or coagulated state, proving constantly the occasion of much sickness in the stomach of certain persons, while in the most part of other men it is an agreeable and readily digested food. It is indeed surprising what a quantity of egg may be digested by some persons ; but I am persuaded that in most persons this power is very much limited, and that a smaller bulk of this than of any other food will satisfy and occupy the digestive powers of most men. At the same time I must observe, that egg seems to me to be a less alkaliescent food than almost any other animal substance, and during its digestion to be less stimulant.*

Whether egg has more or less disposition to render the body plethoric than other species of animal food, I cannot from want of experiment, properly determine.

With respect to the particular qualities of the eggs of different birds, and whether they are in any case considerably different, I cannot clearly determine ; but I am disposed to think they are very little so ; and I am certain that in many instances the peculiar odour and taste of the flesh of the bird is in no degree communicated to their eggs. For example, in certain sea-fowl, whose flesh is of the rankest odour and taste, their eggs are as free from taste and smell as the eggs of our domestic fowl. Even in the latter, we can observe some difference in the taste of the yolks, and in the density of the whites ; which seems to depend on the food the animal lives on. But these differences are very slender : and whether other causes may give like differences in the eggs of dif-

* The substance, however, when it is not applied to its proper functions of nourishing a chick, is liable, while yet in the shell, to a peculiar putrefaction ; and when eaten in that condition, is highly offensive to the stomach ; and when it is to a high degree, it becomes very noxious.

ferent birds, I cannot positively assert; but in certain different birds, the colour of the yolks and the density of the coagulated whites, are somewhat different from one another. The yolks, however, are still yolks: and the whites are still so much of the common nature of whites, that their difference, as aliments, is hardly to be assigned.

§ III. Of ALIMENTS taken from the class of AMPHIBIA.

By *Linnaeus* this class is divided into three orders: of *Reptiles*, *Serpentes*, and *Nantes*: but we are here to take notice only of the two first; which in their structure, æconomy, and qualities, have a manifest affinity with one another, and are very different from those of the *Nantes*. These, though they have some similarity in their æconomy with the *Reptiles* and *Serpents*, are so much otherwise of the nature of fishes that they are, in every consideration of them as aliments, to be separated from the former, and joined with the latter.

Of the *Reptiles*, the most noted, and first to be taken notice of, upon account of its being so much esteemed as an aliment, is the *Tortoise*. The flesh of the sea-tortoise, the only one I am acquainted with, is a white meat very much resembling that of the young quadrupeds; and from this we judge that the difference between the nourishment afforded by the one and the other cannot be great. It appears from the experiment of *Mr. Geoffroy*, that the tortoise affords less gelatinous matter in solution, and less volatile alkali in distillation, than the flesh of quadrupeds; and consequently in equal quantities may be somewhat less nourishing and stimulant: but as it affords a gelatinous solution, and is upon this account less perspirable, it may be still very considerably nourishing, and the gelatinous parts of its substance may be particularly such.

The flesh of *Frogs*, with the use of which we are little acquainted in this country, seems, from the analysis of *Mr. Geoffroy*, to be, both in solution and distillation, of the same qualities with that of the tortoise, though, as less gelatinous, to be therefore less nourishing. But however that may be, their qualities are in no wise peculiar; and I cannot find any foundation for introducing them into bouillons or broths in that nice proportion in which they are frequently prescribed in France.

The qualities of the *Lacerta Guana*, though frequently employed in the West-Indies, we are little acquainted with; but supposing their qualities to be much the same with that of the other reptiles, though the *lacerta* was omitted in my catalogue, it seemed proper to mention it here.

Of the *Serpentes*, as alimentary, I am acquainted only with the common *Viper*, or *Coluber Berus* of *Linnaeus*. The flesh of this has been supposed to be of peculiar qualities; but I cannot find any foundation for this. The flesh of the viper gives out in decoction the same substances as the reptiles above mentioned, and

very much of the same qualities as the decoctions of the quadruped and bird kind.

In distillation, the viper gives out a quantity of volatile alkali; but not of any different qualities, as formerly supposed; nor, as *Dr. Mead* imagined, in any greater quantity or proportion than what is obtained from most other animal substances. That the viper, therefore, has any very peculiar qualities as an aliment, we do not perceive; and that it has any peculiar powers as medicinal, we cannot find the slightest foundation for supposing. We must therefore consider the supposition of either its alimentary or medicinal qualities, as a mark, among others, of the weakness and folly of the ancients, and equally of their modern followers.

§ IV. *Of ALIMENTS taken from the Class of FISHES.*

On this subject writers commonly begin with marking fishes as different according as they inhabit rivers, fresh-water lakes, or salt waters: but I cannot find any foundation for the distinction, as I cannot find any steady general character to be given to them as they inhabit those different waters, or any distinguishing quality that does not in some instances take place in each of them.—We are therefore to consider fish in general as distinguished from the three classes of animals already treated of; which we shall generally speak of under the appellation of Meats; and the difference here is very considerable.

When we began to speak of aliments as taken from quadrupeds and birds, we remarked that the similarity of substance and æconomy in those animals to that of man, gave little difficulty in supposing that the former might be alimentary with respect to the latter; but here, with respect to fishes, there is no such analogy to direct us; and it would be difficult to determine *a priori*, that the substances of fishes must prove alimentary to man. They have indeed several properties in common with other animal substances, as that of yielding a volatile alkali in the first part of their distillation, and that of their being putrescent. But these circumstances would hardly be enough to point them out as alimentary substances to man; and therefore the proof of this rests entirely upon experience, which has shown them to have been at all times, and in every part of the earth, employed successfully as aliments. It is said, that in some parts of the earth there are people who live entirely upon this kind of aliment; and it is certain that with many people it is the chief part of their food. In such cases it appears to be perfectly sufficient for all the purposes of the human æconomy; and whether it is in any case insufficient or less fit for these purposes, we shall consider presently, when we shall have first considered the differences that appear between the substance of these and that of the hot-blooded animals.

There is certainly some difference in the firmness of the substance of different fishes: but it is never so considerable as it is in

the three classes of animals above treated of; and it is curious to observe, that although fishes are long-lived animals, yet the difference of firmness of texture at different ages is seldom remarkable. It is also to be remarked, that although the substance of fishes is putrescent, and at length becomes entirely putrid, yet their putrefaction is with different circumstances from that of the hot-blooded animals. This, however, has not yet been studied by the chemists; and I am unable to say what are the different states of it in its progress, and therefore how far it affects them as an alimentary matter. I cannot truly perceive that it renders it more soluble, or much more irritating to the system, as it does in the case of the meats above treated of.

There is, however, a case, in which certain fishes, independent of the state of their putrescency, give a singular irritation to the system. It is during their digestion in the stomach that certain fishes are ready to occasion a considerable efflorescence upon the skin; sometimes in certain parts of it only, but sometimes over the whole body; sometimes with a considerable febrile disorder, but at other times with very little. It is seldom of very long duration, and commonly passes away by the time that the matter is entirely digested and passed out of the stomach. In some cases I have had it immediately removed by a vomit, bringing up the contents of the stomach.

By all this it appears, that the phenomenon depends upon an operation of the stomach, and not upon any matters being mixed with the blood: and it may be a question, Whether it depends upon an operation upon the nerves of the stomach communicated to the skin, or upon the operation of the substance of fish determined more particularly to operate upon the surface of the body?

This leads to a question, How far the substance of fish is an aliment more or less perspirable than that taken from the hot-blooded animals? I took notice above of *Sanctorius's* opinion of the perspirability of mutton, and of *Dr. Keill's* opinion of the perspirability of oysters, which are a substance somewhat similar to that of fishes: and though I observed that *De Gorter's* experiments had not confirmed either of these facts, yet I allowed that the matter might, and deserved to be, a subject of farther inquiry. By what experiments I have been able to make, it appears to me that the substance of fishes is an aliment somewhat less perspirable than that of meats.

In the comparison of these two kinds of aliment, the circumstance that especially demands our attention, is the quantity of nourishment they severally afford. The common opinion is, that fish afford a weaker nourishment than meat does: and *Dr. Haller* found himself weakened by a fish diet, and alleges that persons are generally weakened by a Lent diet; and the observations of *Pechlin* seem particularly to confirm this. But there may be much fallacy in these observations; as the weakness alleged may be ow-

ing more to the quantity of vegetable aliment employed at the same time than to that of the fish. I have known several instances of persons who felt no weakness from a Lent diet when a great deal of fish was taken; and we have several instances of villages inhabited almost only by fishers, and who therefore live very much upon this sort of aliment, but in whom no diminution of health or vigour appears. It will therefore be very doubtful if fish afford much less nourishment than meat does; and I am persuaded that, if any, the difference is very inconsiderable.

Whilst I make these observations on fishes as an aliment in general, I wish I could distinguish the different qualities of particular fishes: but I find it difficult to speak clearly or positively upon the subject, as no experiments that I know of have been made to determine the matter. It appears that some difference will arise from the difference of texture; and that the tenderer and more gelatinous kinds, as occurs especially in the cartilaginous fishes, will be more easily digested, and more nourishing, than those of a firmer and drier texture. It has been alleged, that fishes, as having less oil in their substance than our meats have, should be therefore less nourishing; and this is alleged with some probability: but how far it goes, it is difficult to determine: for in many fishes the quantity of oil in their substance is inconsiderable: and I would venture to lay it down as a truth, that the oily fishes give an aliment less easily digested, more irritating to the system, but at the same time more nourishing than the leaner. We seem to have examples of this in eel, salmon, and herring: and with regard to the last, I might have observed, when speaking of the nourishment afforded by fish in general, that our herring-fishers, living for some length of time upon this aliment alone, suffer no loss of strength, and seem rather always to be much fattened by this diet.

I can hardly say more on the alimentary qualities of fishes, not having had the opportunity of experience with respect to the great number and variety that are employed as aliments. I can find very few experiments that have been made to ascertain their different qualities; and it appears to me that they have been chosen by their taste rather than by any proper experience of their nutritious qualities.

From some experiments it appears that the aliment taken from fishes is less perspirable than that taken from the hot-blooded animals; but I believe that more experiments will be necessary to ascertain this matter more exactly.

§ V. Of ALIMENTS taken from INSECTS.

Of this numerous class very few are employed as aliments in this part of the world: and I can hardly take notice of any but certain of the *Crustacea*, as the *Lobster*, *Crab*, *Prawn*, and *Shrimp*, which are those only that are seen very frequently upon our tables. The *Crustacea* are indeed of much greater variety; and perhaps

many of them, in other parts of the world, may be used in diet: but they neither come within my plan limited to British aliments, nor have I any proper acquaintance with those others.

With respect to the Lobster and Crab, I am of opinion that they hardly differ in any quality from one another; and that it is only the more elegant appearance of the lobster that makes it appear much more frequently than the crab upon our tables.

The substance of both gives out in decoction a considerable quantity of matter: but this does not determine the quantity of nutritious matter to be greater than what may be extracted by the gastric fluid from other substances which do not give out so much in decoction; and the smaller proportion of volatile alkali that is obtained from their entire substance or from their extract, makes me presume upon their containing less of animal substance than the flesh of quadrupeds, birds, or even of the amphibia.

With respect to them as aliments, we are disposed to conclude them to be much of the nature of the most part of fishes. They particularly approach to the nature of many of these, in being without oil, or in having it in very small proportion; and therefore, in my opinion, affording less nourishment. They appear to be of more difficult digestion than the most part of lean fishes.

With respect to their digestion there is somewhat peculiar often happens, as I have known several instances of persons who could not take even a very small quantity of lobster or crab without being affected soon after with a violent colic, and sometimes with that same efflorescence on the skin which, as we said above, often happens from eating salmon or herrings. In both cases, I believe it happens especially from the idiosyncrasy of particular persons; and how difficult that is to be explained, will appear from what we said above on the subject of Eggs.

§ VI. Of ALIMENTS taken from the Class of WORMS.

Several of this class are used as aliments, but not many in proportion to the number of species which the class comprehends. I shall mention those only which come upon our tables here; which is the circumstance that has given me the opportunity of being acquainted with them.

They are chiefly the animals included in the *Testacea*. The Bivalves afford several; the chief of which is the *Oyster*. This in its fresh and raw state, is of easy digestion; but in its boiled or roasted state more difficult, and often very much so. The oyster seems to be considerably nourishing, and it may be more so, because it is not readily perspired. Dr. James Keil in his experiments, found oysters not only difficultly perspired, but that they even prevented the perspiration of other aliments. *Sanctorius* may be supposed to say the same thing, *Aph.* 438.; but it seems to be difficult to make any thing of his opinion, when he reckons the *Ostracea* among the *flatum gignentia*. *De Gorter* positively asserts, that in his experiments the imperspirability of oysters did

not appear; but from some trials I have made, I am disposed to judge, that oysters are less readily perspired than some other foods.

The other Bivalves chiefly employed in this country, are the *Mussel* and *Cockle*; neither of them, as being of a firmer substance, are so easily digested as the oyster; but in other respects they are seemingly of the same qualities.

The mussel is reported to have, upon several occasions, produced very noxious effects, and given occasion to a suspicion of its being, in certain circumstances, poisonous, or of its carrying a poisonous matter along with it into the stomach. As, however, we do not meet with such accidents in this country, though the mussel is very frequently and largely employed in our diet, I am at a loss to judge of this matter. No writer that I know of has determined the nature of this poison, or of the state of the mussel that renders it upon occasion noxious; and I am ready to suspect that most of the instances of this disorder imputed to mussels, depend either upon an unusual large quantity being taken, or upon an idiosyncrasy in certain persons, rendering them liable to be affected by mussels, in the same manner as we have said certain others are by salmon, herring, and lobster.

Of the Univalve Testacea, the chief is the *Snail*, *Cochlea pomatium*. This is of a tender substance, and therefore easily digested; and from its gelatinous state it is supposed to be very nourishing. I verily believe it to be so; but in what proportion is not ascertained. They are commonly employed upon the supposition of their nutritious qualities in cases of emaciation; and they have been often, in that view, employed in cases of hectic fever.—In materia medica writers, they are constantly mentioned as refrigerant; but nothing can be a greater mistake, for they are still animal substances; and nothing of this kind can be refrigerant, though some of them may be less heating than others.

As all the animals found in univalve shells which are employed as aliments, are of the same genus, I believe what we have said of the snail may be applied to all the others. We must own indeed, that we have not had a proper opportunity of observing the difference: but, in the mean time, are persuaded that it is very inconsiderable.

THE COOKERY OF MEATS.

We have now finished our enumeration of the aliments taken from both vegetables and animals; but in order to judge still more exactly of their effects taken into the body, it will be proper to consider, as well as we can, what changes they undergo by the cookery they are subjected to before they are taken into the stomach.

This consists chiefly in the application of heat; and with very few exceptions, this is applied more or less to the whole of animal

substances. It is, indeed, in the business of aliments by this especially, that man is distinguished from all other animals, who take food as nature offers it; and at least, I know of none of the brute creation that practises any art of preparing their food by subjecting it to heat. If they use any food so prepared, it is only such as has been prepared by the artifice of men.

How far any part of our vegetable aliments is necessarily subjected to heat is not certain; and I do not recollect any species of vegetable substance that may not be taken in its raw state by men of tolerable health and vigour. But, at the same time, the whole of them are upon occasion subjected to a preparation by heat; and men's being directed by instinct so universally to this practice, implies, that in many cases it is proper, and attended with some advantages.

These advantages seem to be, in the first place, that the most part of vegetable substances are thereby rendered more soluble in the human stomach. The only doubt that can arise with regard to this is in the case of vegetable substances, to which, in their crude state, a boiling heat is immediately applied and thereby in many of them a coagulation is produced; in consequence of which they seem to be rendered less soluble in water than they were before: but this does not seem to have any effect on their solution in the stomach. Whether the difficult solution be obviated by some degree of fermentation that necessarily takes place in the stomach, or by the powers of the gastric fluid, it is not necessary to determine; as it remains certain that the action of heat separates in some measure the small particles of bodies; and thereby renders them more readily separable by the solvent powers of the stomach.

In the second place, the application of heat separates and dissipates the volatile parts of vegetable substances, which are seldom of a nutritious nature, and, in many cases, have a tendency to prove noxious.

In the third place, the application of heat to a certain degree, extricates and dissipates a considerable quantity of air that in the natural state of vegetables is always fixed in their substance; and it is probable in this way especially that heat contributes to the dividing and loosening the cohesion of the small parts of vegetable substances. It is certainly in this way, by dissipating a large portion of the air, that vegetables are rendered less liable to fermentation, and less liable to produce that flatulence which is upon occasion so troublesome in the stomach and intestines. On what occasions especially these preparations by heat are proper and necessary, we have frequently hinted above on the subject of particular aliments: and it is only necessary to observe further, that as the heat may be employed in two ways, either in a humid or in a dry form, we are of opinion, that the former is always better suited than the latter to all the purposes above mentioned.

The cookery of animal substances also consists chiefly in the application of heat. It is, indeed, possible that some practices, previous to that application, may be considered also as parts of cookery, particularly salting, drying, and pickling. These practices, however, are merely useful for the purposes of domestic æconomy, as preserving meat from putrefaction, before it be subjected to heat, for a longer time than it could be preserved without such means.

We are, at the same time, of opinion, that these practices can never increase the nutritious quality of meat, or render it even of more easy digestion. Drying certainly brings the solid parts of meat more closely together, which must render it of more difficult solution. The addition of salt, which stimulates the stomach, may seem in some cases to promote digestion: but this must be when the salt is added in small quantity, and when the meats preserved by it are taken in moderate quantity only. For when meats have been long salted they are hardened, and rendered in proportion less soluble in the stomach; and a large quantity of salt accompanying them, is certainly hurtful to the system.

There is one preparation of animal food which is made without any addition, and this, by its being kept for some time before it is subjected to cookery, longer or shorter, according to the season and nature of the meat, but always till it has made some advance towards putrefaction. The tendency to this seems to take place from the moment that life is extinguished in the animal; and the allowing it to take place to a certain degree renders the meat more easy of solution in the stomach; and if the putrescency is in a moderate degree only, it does not seem to hurt the nutritious quality of the meat. How far the putrescency may be properly carried, I cannot determine: but certainly it may be different according to the constitution of the person.

There are persons who seem to suffer no inconvenience from meats, though in a very putrescent state: but although there are persons who can digest tainted meats, that is, meats having the taste and odour which we know to arise from putrescency; yet I know many others in whom the digestion is much disturbed by the smallest quantity of meat tainted by putrescency. But however all this may be, we are clearly of opinion that the keeping of meat for the purpose mentioned above should never go far: for very certainly every advance in meats towards putrescency, renders them more ready to increase the spontaneous tendency of the animal fluids to that state which we take to be always hurtful to the human constitution, as it both favours the coming on of diseases, and aggravates their symptoms and danger when they do come on.

We come now to consider what is properly the cookery of animal substances, or the preparing them by the application of heat.

This is of two kinds, as it is applied in a humid form in *boiling* and *stewing*; or in a dry form, in *roasting*, *broiling*, and *baking*.

Boiling is properly the exposing of meat to the heat of boiling water, while it is immersed in this for some length of time. By this joint application of heat and moisture, the texture is certainly rendered more tender and more soluble in the stomach; and it is only in this way that the firmer parts, as the tendinous ligamentous, and membranous parts, can be duly softened, and their gelatinous substance duly extracted.

With respect to the parts of animal flesh that are of a tenderer texture, the effects are different according to the degree of boiling that is applied to them. A moderate boiling may render their texture more tender without diminution of their nutritious quality; but if the boiling is extended to extract every thing soluble, the substance remaining is certainly less soluble in the stomach, and at the same time much less nutritious. But as boiling extracts in the first place the more soluble, and therefore the saline parts; so the remainder, after boiling, is in proportion to the length of that, less alkaliescent and less heating to the system.

Boiling is commonly practised in open vessels, or in vessels not very closely covered: but it may be practised in *digesters*, or vessels accurately and tightly closed: and in such vessels the effects are very different from what they are in open vessels. As we can hardly employ any other degree of heat than that of boiling water, the water in the digester is never made to boil, so there is no exhalation of volatile parts: and although the solution is made with great success, and may be to any degree required, yet if that is not carried very far, the meat may be rendered very tender, while it still retains its most sapid parts; and this kind of cookery will give always the most desirable state of boiled meat.

Boiling in the ordinary way may be considered as different according to the proportion of water applied. If a small quantity only is applied, and the heat in moderate degree is continued for a long time, this is *Stewing*, and has the effect of rendering the texture more tender, without extracting much of the soluble parts: and this, therefore, leaves the meat more sapid, and sufficiently nourishing.

The other application of heat is in a dry form, or when the meat subjected to it is in a dry form, or nearly so; at least it is without the addition of water or other fluid that may dissolve any part of its substance. This application of heat is again of two kinds, as it is in close vessels or as it is exposed to the free air.

The first is *Baking*; and though commonly in this practice the cover of the meat is only of paste, any considerable exhalation is prevented, and the retention of the juices under application of heat renders the meat more tender: and in all cases when the heat applied loosens, and in some measure extricates, the air without

exhaling it, the substance is rendered more tender than when with any other application an exhalation is allowed.

In *Broiling* an exhalation takes place: but as the heat of a naked fire is more nearly applied, the outer surface is in some measure hardened before the heat penetrates the whole, and thereby a great exhalation is prevented, while the whole is rendered sufficiently tender: but this kind of cookery is especially suited to meats that are chosen to be eaten a little rare.

Nearly a-kin to this dressing is that of *Frying*: but as in this the meat is cut into thin slices, and laid in a vessel which is interposed between the meat and the naked fire, the heat is applied more equally to the whole substance. But as the part of the meat lying next to the bottom of the vessel would be suddenly hardened by the heat, it is always necessary to interpose some fluid matter. When this, as most commonly it is, is of an oily matter, as a strong heat applied to such matter is ready to render it empyreumatic, or at least less miscible with the fluids of the stomach; so all fried meats are less easily digested than those of any other preparation, except that sometimes the same may happen to baked meats, to which an oily matter, and that only, is added to avoid the too drying heat. It is obvious that the preparations of stewing and frying may be frequently joined together; and according to there being more or less of the one or other, the effects may be judged of.

The manner of applying heat yet to be mentioned is the frequent one of *Roasting*. In this, as by a proper artifice an equal application is taken care of, the effect of heat in rendering the meat more tender is certainly obtained; and though a considerable exhalation is made, it is almost only of a watery humidity. This indeed would take place to a very great degree, and render the meat again more insoluble, were it not that large masses only are subjected to this operation, and that thereby the outer surface is first condensed, and prevents the exhalation from the interior parts. At the same time, an oily matter is commonly and repeatedly applied to the outer surface, which prevents both much exhalation and any great hardening of the outer surface, till the heat has penetrated the whole, and rendered it sufficiently tender. From all which the effects of roasting, and the proper conduct of it, may be understood.

Having thus explained as well as we can, the chief parts of cookery, and their effects as consisting in the application of heat, we have only to observe, that meats, as presented upon the table differ further only, by the difference of sauces, or humid matters, which are employed to obviate the dryness of meats, and to render them more agreeable to the taste.

The sauces have for their basis oily matter, or strong gelatinous extracts from other meat; and both these rendered more agreeable by the admixture of some other alimentary matters, and more

poignant by the addition of various condiments; the effects of which in the stomach and mass of blood will be understood from what we are presently going to say of them.

CHAPTER III.

OF DRINKS.

UNDER the titles of Aliment, Food, or Meat, I comprehend every thing, whether solid or liquid, that can serve for supplying the solid matter of the human body: and under the title of Drink, I comprehend every liquid that is fit to supply the watery parts both of the solids and fluids.

How much water enters into the composition of the fluid, and even the solid, parts of our bodies, is well known; and it is equally well known that the same water, by various means, is in continual dissipation and waste, and consequently that a constant supply of such liquid is absolutely necessary to the support of the system. That such a supply may be duly made, nature has given the appetite of thirst, which leads to the taking in of drink.

The drinks we take in are seemingly different matters; but the supply mentioned may be made by pure elementary water alone; and that all the drinks which supply the necessary liquid, do it only by the quantity of elementary water they severally contain, will, we suppose, be readily allowed. Our drinks, therefore, may be considered as of two kinds; one consisting of water alone, such as nature affords it; and another whose basis or principal part is such natural water, but with certain additions made to it by nature or art.

SECT. I.

OF SIMPLE WATER.

THIS, so far as I know, is the only liquid taken in under the appetite of thirst by the whole of the brute creation; and from thence it may be presumed to be the liquid in general very well suited to the animal œconomy. That it is sufficiently suited to man, will appear clearly from the great part of mankind, who, during the course of their lives, take in no other. It is true, indeed, that men in their infancy take milk from the breasts of their mothers; and there are some people who take much milk through the course

of their lives: but there are certain nations who have no domestic animals to afford this, and therefore for drink must depend upon water alone; and the state of health in those persons who, from various causes take water only, shows that this is perfectly well suited to the purposes of the human æconomy.

Simple water, therefore, that is, such as nature affords it, is without any addition the proper drink of mankind. But though I have used the title of Simple Water, it must be remarked that nature hardly ever affords water perfectly simple, without its being more or less impregnated with some other matters; and upon this account a distinction has been made of the natural waters, as being from different impregnations more or less proper for the use of man. How far this distinction is to be prosecuted, I dare not determine; but I am much disposed to establish this doctrine, That it is not to be prosecuted with much nicety, because we are of opinion, that every natural water which has no impregnation sensible to the taste or smell of a person of common sensibility drinking it, is very well fitted for the drink of mankind.

Still, however, it is observed that certain waters which have neither taste nor smell, are however, discovered to have certain impregnations that may be considered as less salutary to mankind than more simple, or what may be called more pure water.

This may be supposed to take place especially in the waters distinguished as Hard and Soft. The former are impregnated with a portion of selenites, or other earthy matter, which renders them improper for such purposes of domestic æconomy, and might be supposed to render them less salutary than purer and softer waters to the human constitution. Without entering, however into any nice disquisition upon this subject, it will be enough to say, that the softer waters, when in our choice, are to be preferred: but at the same time we cannot discover that the harder waters, even when they have been very much and constantly employed, have been very evidently hurtful; at least we can find no good or clear evidence of the bad effects that have been ascribed to them.

I lived for many years in a large city in which the waters very universally employed were very hard: and although softer waters were within their reach, the most part of the people used only the hard. But among these people I found no endemic diseases; and at least none that I could impute to the water they drank, and certainly none that I did not find as frequent in a city which I have also practised in for many years, whose inhabitants very universally used no other than a very soft water.

Physicians have entered into still nicer distinctions of common waters; and have distinguished them as they are Spring waters, Pit-well waters, River waters, or Lake waters: but there seems to be little foundation for distinguishing these from one another.

Uncommon impregnations of some of them may upon occasion take place; but we believe such will always be apparent enough to prevent their being used: And with regard to their common state, it is still enough to say, that no impregnations which are not sensible to the sight, taste, or smell, are of so much consequence as to deserve our attention and choice, in their employment.

On this subject it would be thought strange if I should omit to mention Rain and Snow water, about which so much has been said. We have, however, only to say, that although these are perhaps the softest and purest of all common waters, yet I cannot perceive that in their use they give any advantage above others: and, on the other hand, we are persuaded there is no foundation for supposing some of the particular bad effects of snow-water that have been ascribed to it.

We conclude the whole subject with remarking, that the nice and accurate examinations that have been made of the state of what I call Simple or Common Waters, were very commendable; but now they are made, they do not lead me to think that much nicety is necessary in the choice of them: and with respect to the bad effects imputed to many of them, we do not find there is any foundation for supposing that any of them can produce scrophula, fatuity, or other diseases alleged to be endemic in certain countries.

The consideration of mineral waters belongs entirely to another place.

SECT. II.

Of DRINKS, whose Basis is Water, but to which Additions have been made by Nature or Art.

TO be employed as drinks, various additions have been made to water: as the acid juices of fruits, farinaceous matters, aromatics, tea, coffee, and other vegetable substances. In so far as these, though joined with water, retain their peculiar qualities, the qualities of the drink made by such additions, must depend upon the quality of the matter that has been added to the water. But as the qualities of these matters have either been treated of already under the title of Aliments, or are to be treated of hereafter under that of Medicine, it is not necessary here to consider further the nature and qualities of such drinks.

FERMENTED LIQUORS.

There are, however, substances which, joined with water, make the liquor undergo a considerable change, by its being subjected

to a vinous fermentation: and as liquors thus prepared are employed as drinks in every civilized nation, they properly become objects of our particular attention, and are therefore to be considered here.

These fermented liquors may be mentioned in the *first* place as of two kinds: one of them, prepared from the juices of fruits, and which, from the appellation of the principal species, we name *Wines*; the other, from a substance extracted by water from certain seeds or roots, which we name *Ales*: and we begin with the consideration of the former.

On this subject we do not think it necessary to give the general doctrine of vinous fermentation, which we suppose to be commonly known. Here we shall only say, *1st*, That we take it to be now well ascertained, that sugar, or substances containing it, and these so far only as they contain it, are the subjects capable of being changed by fermentation. *2dly*, That by fermentation the sugar is variously changed, and particularly that in part it is converted into alcohol, which I need not here define; and that it is the juice of fruits in consequence of fermentation impregnated with a portion of alcohol, that properly and strictly constitutes a Wine; and that it is the state of this, with some other matters originally in the subject, more or less modified by the same fermentation, that gives wine all its different forms and qualities.

By its sensible qualities and other properties to be discovered in it, wine is found to be in different conditions: and it is our chief business here to take notice of these, and to investigate their causes, so that we may better ascertain the effects of particular wines both in diet and medicine.

To this purpose we would allege, that, in general, the different condition of wines depends partly upon the nature of the matter subjected to fermentation, and partly upon the circumstances occurring in the conduct of this.

With respect to the first, the chief difference that occurs is in the quantity of sugar it contains; and it seems only necessary to consider this as it occurs in the juice of the grape, from which most generally wine is prepared.

The botanists commonly suppose that the vine is a plant of one species only; and that the diversity which appears in its fruit, points out to them only so many instances of a variety, that by different causes may be produced in the same species.

For aught I know this may be just. As the vine is propagated by cuttings, the same variety may steadily continue to appear; and the cuttings having been taken from vines in different condition, we may have a variety of fruits, in which a difference in the nature of the subject may continue to appear: which, however, we still suppose to be always determined by the quantity of sugar they severally contain.

This quantity, however, in any grape, may be varied considerably by different circumstances. And, 1st, the kind of grape being given, the quantity of sugar it contains may be different by the soil in which it grows, as this is more heavy or light, the latter giving less juice; but this more perfectly ripened, and therefore containing a greater proportion of sugar.

2dly, It may be more or less saccharine according to the climate in which it grows. It is heat that gives maturity to fruits: and therefore to the production of the saccharine matter they contain. And with respect to the grape, it may be confidently said, that, within certain bounds, the more heat the grape is exposed to, the more maturity it acquires, and the more saccharine matter it will contain. It is asserted, that a certain temperature of climate is necessary to give the greatest perfection to the grape; and that this is from the twentieth to the fiftieth degree of latitude on each side of the equator. This perhaps is not yet, by accurate observations, exactly determined: but it is pretty certain, that while beyond fifty degrees, the ripening of grapes is commonly imperfect, it is always more readily so as the climate is, within the bounds mentioned, nearer to the equator.

3dly, The saccharine matter of the grape will be always greater as the fruit is allowed to acquire more maturity, by remaining long on the tree where the climate allows of it.

4thly, It is to be observed, that the saccharine juice of the grape is often accompanied in the same fruit by acid and acerb juice; which may be considered as both diminishing the quantity of saccharine matter, and rendering it less fit for fermentation: and this happens both from the original nature of the grape and from its not attaining a full ripening. If the ripening, therefore, be not complete, as we know that all fruits ripen by degrees, and very often when the juice of the fruit in its central parts is fully ripened, there is an acid and acerb juice still remaining in their cortical parts or husks; so we find, that, according to the manner of the expression, of the juice, it comes out in a different degree of fitness for fermentation. What flows upon a light pressure only, is a more purely saccharine juice; while that flowing, in consequence of a more forcible expression, is always less sweet; and according to the greater force employed, more acid or acerb.

These are the circumstances of the grape, which, according to their state, may give considerable difference in the condition of wines.

In the *second* place, we suppose the difference of wines to depend upon circumstances in the conduct of the fermentation.

This at first is active, and somewhat violent throwing up a great deal of the matter to the surface of the whole: but after a certain time, the brisk intestine motion becomes much less; and instead of throwing up matter to the surface, allows what had been formerly thrown up to fall down to the bottom. After this, however,

some fermentation continues, though in a more slow and inactive manner, which may continue for a long time; and its doing so is necessary to a more complete assimilation, and therefore to the formation of a more perfect wine.

In this process, the quantity of fermentable matter being sufficiently large, the more active the first fermentation is, within certain bounds, the greater quantity of alcohol will be produced, and therefore a strong wine; and the longer the slow fermentation is protracted, the more perfect will be the wine, and the more free from all other matters adhering to it. But if either the first active fermentation be hurried, or the second fermentation pushed too far, the whole of the wine, or a part of it, will be converted into a vinegar of very different qualities from the wine, or from the parts of it which still retain that nature.

From this view of the fermentation, it will readily appear, that what is frequently considered as wine, and such indeed as are most of the wines in use, it may contain three different matters. *1st*, A portion of must, or unassimilated matter. *2dly*, A portion of a proper wine, or in which, by the fermentation, a quantity of alcohol is produced; and *3dly*, A portion of vinegar produced by too active or too long protracted fermentation.

These different matters will appear more or less copiously at the different periods of the fermentation. At an early period, and in what may be called a new wine, the must will be most abundant. As the period of fermentation advances, the proportion of genuine wine will be more considerable; and if the fermentation has all along been properly managed, a vinegar will not appear but in very old wine; and from the proportion of these several matters, the qualities of wine depending upon the period and state of fermentation, may be properly ascertained.

New wines are especially liable to a strong degree of acescency when taken into the stomach, and thereby to occasion much flatulency and eructations of acid matter. The uneasy sensation of heartburn or of violent pains in the stomach from spasms, is thereby also often produced: and the same acid matter passing out of the stomach, is liable, by a mixture with the bile, to produce painful spasms or colics in the intestines, and to excite violent diarrhœa.

Ripe and perfect wine, unless there is a fault in the stomach taking it in, is not liable to have these effects; and by the alcohol it contains, it is fit to strengthen the stomach, and to promote a regular digestion. By the same alcohol also, it is fit to stimulate the whole system, and proves thereby cordial and exhilarating; but by the same matter taken in larger quantity, it becomes intoxicating and a powerful sedative.

Wines containing a portion of vinegar have thereby a proportion of their alcohol destroyed, and thereby the stimulant power of the wine lessened. At the same time, though the vinegar be less

liable to a hurtful acescency in the stomach than the unfermented juices; yet if there remains any such unfermented matter in the other parts of the wine, or otherwise accidentally present in the stomach, the vinegar or acetous acid may, by exciting an acetous fermentation, occasion very violent disorders, and often more violent than those arising from spontaneous acescency.

We have thus endeavoured to explain, in what manner wines may be in different conditions according to different circumstances in the conduct of their fermentation. But we are far from being able to apply these distinctions to the wines in common use; as we are not sufficiently acquainted with the various practices employed by the makers of wine in different countries; and much less with the various artifices employed by merchants or wine-dealers, to hide and disguise the real state of wines. Instead of entering upon these, we shall endeavour to say, how in some measure the nature of wines may be judged of by some of their sensible qualities.

Wines are of somewhat different odours; but what qualities these different odours point out is by no means ascertained. In general, the peculiar odour of any wine being strong and vivid, always implies both the most perfect and the most entire state of such wines, provided always that this is examined in wines of some age, as new wines under a more active fermentation may give out a more striking odour; this, however, to be distinguished by the experienced from that of a perfect wine.

With these circumstances of odour are much connected the briskness or flowering in the cup of wines, which always shows their being still under some active fermentation; and for the most part that there has been a quantity of acid present in the original juice.

There are, however, wines very well ripened, and in which there is no active fermentation subsisting, that notwithstanding will upon a fresh application of air, and some agitation in being poured out, readily flower in the cup; but their being in no improperly active fermentation, will readily appear by the flowering passing again immediately away.

With regard to tastes, some wines are considerably acid; and this must be owing to their having been made of juices containing much acid and little sugar: and for which reasons they are wines containing little alcohol. But it is to be observed of such wines, that many stomachs are fitted to obviate their acescency; and as the acid in some measure obviates the stimulant power of alcohol, if such wines are not directly refrigerant, they are at least less heating.

We have mentioned above, that wines may appear acid from a quantity of vinegar formed in them: But this kind of acidity will be very readily distinguished by the freshness accompanying the former, and the rapid taste frequently attending the latter.

Many wines are remarkably sweet, and may be so from different causes. It sometimes depends upon the original sweetness of the grape, not to be entirely obliterated by any fermentation; and by a complete fermentation, the same may be made into the most perfect wines. The sweet wines, however, may be always suspected of retaining a portion of unassimilated matter, especially when the active fermentation has been industriously checked: and unless these circumstances are compensated by a large proportion of alcohol produced in them, they will always be ready to show the effects of unassimilated matter remaining in them.

Wines may be more rough, and somewhat styptic, or more soft and smooth to the taste. The former commonly accompanies the acid wines, and may be owing to the original acidity or acerbity of the fruit: but most commonly it is owing to the juice of the husk taken out by too strong expression; and that even from grapes otherwise containing a great deal of saccharine matter. It is a quality that renders wines more astringent; but unless as depending on the causes disposing it to much acescency, it is otherwise innocent. It appears always most considerable in new wines, and is much smoothed by a long protracted fermentation. Hence soft and smooth wines, whilst they show both the original juice to have been free from any acerbity, they presume also the most perfect fermentation.

We have now only to take notice of wines that are distinguished by their colour; which, as it is so frequently given by art, renders us very uncertain of the qualities that would have been in the colourless liquor.

So far as the red colour of wines is without the addition of colouring matter, I believe it is always taken from the colour of the husks subjected to the first fermentation of the juice; and therefore gives to these juices, and the wine made of them, some degree of roughness and astringency: and if the conduct of the fermentation is otherwise the same, it is only in this quality of a slight astringency that we can perceive red wines to differ from white. It is, however, possible that as wines are at first intended to appear white or red, that they may be subjected to a different management in the fermentation, and thereby may differ more considerably in a manner I am not acquainted with.

We have thus endeavoured to point out the different condition of wines, and to assign their several causes: and we might now make some remarks on the wines that are made from the juices of other fruits than that of the grape; as those of apples, pears, cherries, and also of those made in imitation of wine from sugar or honey. But we are persuaded, that the principles laid down with respect to the wine made of the juice of the grape, will apply to all the other kinds mentioned: and we have now only to say somewhat of the other principal species of fermented liquors which are called *Ales*.

Fermented liquors affording alcohol may be made from the roots of several vegetables: but these, so far as I know, have not been made into potable liquors: and those liquors, or what I call Ales, have only been prepared from farinaceous seeds.

These, by melting, or by exciting and conducting their germination to a certain degree, have always a sugar evolved, and rendered evident in their farinaceous substance; and this saccharine matter, extracted by water subjected to a fermentation analogous, and very similar, to that of wines, gives our ales containing a quantity of alcohol. They have, therefore, in general, the cordial, exhilarating, intoxicating, and sedative qualities of wine.

These ales, like wines, are found in various condition, depending partly upon the quantity and condition of the saccharine matter employed, and partly upon the management of the fermentation they are subjected to.

Ale may be prepared from any of the Cerealia. Barley has been chiefly employed, and we think properly, as its germination is most easily conducted; and that under its germination, it gives out its sugar most readily and in greatest quantity: and though the other farinacea may be employed, it is alleged, that they would severally give an ale of a different quality. This, however, we judge to be without foundation; and are persuaded, that the ale prepared from other farinacea, would not show any essential differences from that of barley. *Spielman* says, that ale prepared from oats is bitter: but I have seen it often prepared from that grain without any bitterness, and proving in every respect a very perfect ale; hardly to be distinguished in any quality from that made of barley.

Now, however, to speak of ales made in the ordinary manner, they will be stronger or weaker according to the quantity of the saccharine matter employed in them: which will be more or less according to the quantity of well-ripened farina in the barley employed; according to the more or less exact conduct in malting of it; according to the proper and complete extraction of the saccharine matter by water; and when a large portion of water has been necessarily employed for a more complete extraction, according to the dissipation more or less of a quantity of the superfluous water.—These are the circumstances, according as they are managed, which give strength or weakness to ales; and with respect to their other qualities, they will depend upon the conduct of the after fermentation.

The infusion of malt or wort, as it is called, is not so well disposed to fermentation as the juices of fruits, and therefore requires a ferment to be added to it; and that being added, the conduct of the fermentation is very much the same with that of wines; at first, very active, and afterwards slowly protracted for a long time; but however managed, it is very doubtful if the ale ever can be rendered so perfect and complete as in the case of wine. It is

probable, that in most ales, there is a large portion of unassimilated farinaceous matter, which therefore renders ales more nourishing than wines; but, for the same reason, ales, *ceteris paribus*, are more liable than wines to acescency in the stomach. It is commonly supposed, that the viscidty of worts is never entirely corrected by the fermentation; and therefore that ales are more likely than wines to fill the vessels of the human body with viscid fluids: but I am persuaded that this deserves little attention; as it is probable that the power of the gastric fluid, and of the fermentation which happens in the stomach and intestines, reduces the whole nearly to an equality in respect of fluidity.

These are the observations I have to make with respect to ales in general; and with respect to the various conditions that ales may be in, I expect they will be readily understood from what we have said above on the differences of wines, as depending partly upon the difference of the fermentable subject, partly upon the different conduct of the fermentation, and especially upon the different period of fermentation at which the liquor is taken.

On the subject of drinks, it is proper for me to observe, that instead of fermented liquors, which have their qualities chiefly from the alcohol they contain, it has been common to separate the alcohol, and in its separate state to employ it in the composition of our drinks. It is often so employed by the addition of water alone; sometimes joining a little sugar, and sometimes joining both sugar and a portion of acid, for the most part of the juice of lemons; and this composition makes the liquor named *Punch*. It is not necessary to prosecute this diversity here; for it is enough to our purpose to say, that alcohol, separated from the fermented liquor in which it is produced, is always a more stimulant, inflammatory, and narcotic matter, than when it was blended with the other parts of the fermented liquor. The dilution of it with water alone may moderate these qualities, but not in any great degree: and the blending it with sugar, and the juices of fruits, may do it still more, but never entirely.

In these practices, it is common to employ the alcohol as it is diversified, by the different fermented liquors from which it is drawn: and thus diversified, it may carry along with it certain oily matters, which render it more agreeable to the palate, perhaps to the stomach of particular persons: but I would maintain, that these different states of it in arrack, rum, brandy, or malt-spirit, do not differ from one another in the essential qualities of alcohol, and very rarely in their effects on the human constitution.

CHAPTER IV.

OF CONDIMENTS.

ALTHOUGH these are not properly alimentary matters, or become ingredients in the composition of the animal fluid, yet as they are taken in with the proper aliments, and modify the digestion and assimilation of these, they are properly treated of in this place. They are of two kinds, saline and acrid, having this acrimony for the most part residing in their oily parts. Of the first, the chief is sea-salt: and it is especially employed for preserving meat before it is employed in diet for a longer time than it could be otherwise preserved from putrefaction.

For this purpose it must be applied in large proportion, and so incorporated with the substance of the meat, that it cannot be again washed out before the meat is employed in diet. It happens, therefore, that when salted meats are employed in that condition, the salt is often taken in large quantity, and diffused in the mass of blood. If the salted meats, however, be taken in moderate quantity only, the salt has the effect of exciting the powers of digestion; and such meat is often more easily digested than entirely unsalted meats are.—But when salted meats are taken in large quantity, and make the greatest part of the diet, the salt increases greatly the saline state of the blood, and induces all the symptoms of scurvy. This indeed of late is a doctrine disputed: and it would not be proper for us to enter into the controversy here; but if it were, we are persuaded that our opinion could be well supported, and that the arguments on the other hand might be shown to be fallacious and false.

If it should be found that the serum of the blood in scorbutic persons proves antiseptic, as has been alleged, this may imply that such serum is in itself not putrid, and which indeed is not necessarily to be supposed in scurvy: but such serum cannot certainly prove antiseptic, but by its containing a larger proportion than usual of saline matter. Nothing can appear to me more extraordinary than *Dr. Lind's* assertion, that the serum of the blood in scorbutic persons is not anywise acrid to the taste; for in numberless trials, I have never found the serum of the blood in the soundest persons without an acrimony discoverable by the taste: and if the saline efflorescence on the surface of the body, which *Dr. Hulme* takes notice of, be common, as I believe it is, in scorbutic persons, it is an irrefragable proof of the saline state of the blood in such persons.

Having thus mentioned the effects of a large proportion of sea-salt introduced into the body, it is, however, to be observed, that a certain quantity of it is necessary to the human œconomy. This appears from the desire of salt being an instinct universal in the

human species, and from its being universally what gives relish to almost every kind of food. This relish of salt is an institution of nature, the efficient cause of which we cannot explain; but we presume very confidently, that it is adapted to serve some beneficial purpose in the æconomy, although we do not well understand either the cause or the purpose of this.

We can perceive very clearly that it proves a stimulus to the stomach, and may thereby promote its action, and therefore the digestion performed there. But this still does not sufficiently explain its being so constantly necessary. We might think of its antiseptic powers which might be useful in the human æconomy; but its poisonous quality in carnivorous animals, and the utility of it in the phytivorous, turns us off entirely from all our views of its antiseptic powers in the ordinary use of it. On the contrary, we might take up with the late *Sir John Pringle's* opinion, that though in large quantity applied it is antiseptic, yet in small quantity it has contrary effects. This, however is a doctrine not yet with me so well established that I can venture to apply it, or find that it will obviate the difficulties occurring upon this subject.

On this subject of saline condiments, it seems proper to observe, that nitre is frequently employed and joined with sea-salt as an antiseptic in preserving meat for some time before it is employed in diet. As nitre in every proportion is a powerful antiseptic, we have no doubt of its answering the purpose mentioned: but as it is commonly used in small proportions only, we believe the particular effects of it in the human body are not to be perceived.

Another saline substance employed as a condiment, is sugar. The qualities of this, as a nutritious matter, we have spoken of above; and the qualities of it as a medicine we shall speak of hereafter. We have now to consider it as a condiment only; and in this view it is certainly antiseptic, and is therefore properly employed in preventing the putrefaction of animal substances.

It is also frequently applied to vegetables; but the preparation of boiling, which is commonly necessary in order to their being impregnated with the sugar, for the most part dissipates their volatile and active parts: so that such are the condita, except a few that contain a large proportion of a more fixed aromatic substance, that none of them can be considered as any thing else than a mass of sugar.

This is often applied to the acid and acescent fruits; and when applied in the consistence of a syrup, it preserves them for a long time from any fermentation, but it does not destroy their acescency: and when such *Preserves* are taken into the stomach, the sugar introduced along with them renders them much disposed to an acescent fermentation.

In the quantity that sugar is commonly employed, either for improving the relish of several kinds of food, or for correcting their acidity, it can only be hurtful by its acescency in the stomach, and can hardly make any proper part of the mass of blood. Although the experiments of the late ingenious *Dr. Stark*, are hardly decisive on this subject, I am ready, however, to believe, that if it is taken in very large quantity, and in greater proportion than it can enter into the composition of the animal fluid, it may increase the saline state of the blood, and may induce various disorders.

Another saline condiment, yet to be taken notice of, is that of vinegar. It is a powerful antiseptic, and may be employed in several ways for preserving animal substances from putrefaction: and if we may believe what was said above with respect to acid in general, as entering into the composition of the animal fluid, we must consider vinegar as a vegetable acid that may be employed or thrown into the body with more safety than the fossil acids, though these are in experiments out of the body more powerful antiseptics. Animal food preserved by vinegar is hardly ever so much impregnated with it as to be rendered less digestible or less nutritious. It renders it only less putrescent; and therefore it is a condiment of animal food that is in every respect suited to the human constitution.

Vinegar is also employed in the preservation of vegetables from every fermentation, whether acescent or putrefactive. The vegetables so preserved are called *Pickles*; and a great variety of vegetables is employed in making such. But the boiling that is commonly required dissipates so much of the volatile and active parts, that the peculiar qualities of the vegetable hardly ever remain; and almost the whole of our pickles may be considered as having no other quality but that of the vinegar they are impregnated with.

This is certainly, as other acids are, often useful in exciting the action of the stomach, and thereby promoting appetite and digestion; and if it be duly prepared by a very perfect fermentation, it will check rather than favour the acescency of vegetable matters in the stomach. This is an advantage which it has over the native acid of vegetables, which very often in the stomach runs into an acescent fermentation, and readily also excites it in other substances there.

It is, however, still to be remarked, that acids, and especially vegetable acids, although in a certain quantity they may excite the action of the stomach, yet in a larger quantity, and in certain stomachs, they prove truly refrigerant, and considerably weaken the tone of the stomach, so as thereby to prove hurtful in the gout and some other diseases.

These are the several condiments of the saline kind; and we have said that there is another kind taken from the vegetable king-

dom, which I have put under the general title of Acrids, but which again may be divided into two kinds: the one, of aromatics imbued with peculiar and pretty strong odours; and the other, of more simple acrids embued with little peculiar odour.

The aromatics are such substances as contain a large proportion of essential oil. They may be considered as especially of two kinds; those produced in the torrid zone, containing an oil of greater specific gravity than water, but of some volatility, and at the same time acrid and inflammatory as applied to the sensible parts of our bodies.—The other aromatics are those afforded chiefly by the verticillated or umbelliferous plants of Europe. They are of less specific gravity, and of less acrimony, but of more volatility.

The whole of the essential oils are more or less antiseptic.—Camphire, which I consider as of the number, is in this respect the most powerful; and the whole of the essential oils seem to have the same quality, as approaching to the nature of that. The camphire, however, as disagreeable both in taste and odour, is not, that I know of, employed as a condiment; while the others, from their agreeable odour, are the most frequently.

They are employed in two ways: first as antiseptics, and joined with the saline matters above mentioned, for preserving meat from putrefaction before it is to be employed in diet; or, secondly, they enter into our sauces, and are taken in with our food, either to render these more grateful and sapid, or by the stimulus they give to the stomach, to assist in digestion. One special purpose may be, that their volatile parts, by mixing with the air arising from the aliments, they may excite the action of the alimentary canal, and assist in the expulsion of the air distending it. With respect to this purpose, the qualities of the several aromatics will be taken notice of hereafter, when they are to be considered as medicines.

With respect to them as condiments, we have only to observe further, that in moderate quantity they may promote digestion, and prove carminative; which shows that they are most properly employed with a vegetable diet: but as in large quantity they are stimulant and heating to the system, they are not necessary with animal food; and their frequent repetition renders an increase of their quantity constantly necessary, and thereby they certainly weaken the tone of the stomach.

Besides the aromatics, the acrid substances employed as condiments are especially taken from the class of tetradynamia, and they are chiefly the *mustard* and *horse-radish*. They are chiefly employed as taken in along with our food; and they certainly stimulate the stomach and assist digestion; and further, as they evidently promote perspiration and urine, they obviate the putrescent tendency of the system. This has been so much remarked, that the vegetables of this class, as fraught with this peculiar acrimony, are justly denominated Antiscorbutic. It will

readily appear, that from the quality mentioned, these substances are as well suited to be used with our animal food as the aromatics are to be the proper condiments of our vegetable aliments.

Akin to the tetradynamia, and containing an acrimony nearly of the same quality, are the plants of the garlic tribe.—Those of the milder kind, as the onion and leek, and especially when deprived of their acrimony, afford a great deal of nutritious matter; and so far as these, with the eschalot and others, are taken in as condiments, they are extremely safe and proper. The more acrid of this genus, as the garlic, is almost only employed as a condiment: and where the odour and taste can be admitted, it certainly stimulates the stomach very strongly, and promotes digestion. As promoting perspiration and urine, the whole of this order of plants are, with the tetradynamia, properly joined with our animal food, and justly also reckoned among the antiscorbutics.

Amongst the condiments, there is one sometimes employed which I cannot refer to any general head; but its odour, resembling in some degree that of the garlic I have been just now speaking of, reminds me of it in this place. This is the *Asafetida*, which in the countries producing it, is of a less disagreeable odour, and much employed as a condiment; and to such persons of this country as can admit of its odour, it proves grateful to the taste, and useful in promoting digestion.

Of the more simple acrids, the first that deserves to be mentioned is the *Capsicum*: which is without odour or particular taste, and is so readily diffusible, that it joins agreeably and conveniently with any other condiment or sauce. It seems to stimulate the stomach and promote digestion, and taken in largely is certainly amongst the most heating of the condiments.

These are the chief of the condiments; but they are seldom employed singly, but variously combined to form a variety of sauces added in the kitchen or upon the table. What commonly makes the foundation of these, is what is called Ketchup. This is properly, in the first place made of mushrooms, under a certain fermentation, probably putrefactive; and after it has undergone this, a variety of aromatics are added, as may be agreeable to the taste of particular persons. What the whole derives from the mushrooms, I cannot perceive; and think the ketchup, and many other compositions, daily presented to the public, may all be considered as combinations of salt, vinegar, and aromatics: and from hence I think their qualities may be understood.

Another famous sauce and condiment is what is called Soy, which we have only as imported from the East Indies. By the best accounts I can find, it is a preparation from the seeds of a particular species of the *dolichos*. It appears to me to be prepared by a particular fermentation of the farina of this seed in a strong lixivium of common salt. Its taste is chiefly saline, with very lit-

tle aroma; and its peculiar qualities, different from the other combinations mentioned, I cannot perceive,

I conclude this article of condiments with observing, that the whole of our seasonings consist of salt, vinegar and aromatics, combined together: and if they are taken only in the quantity necessary to render the food more sapid, they may increase the appetite and favour full eating; but they can hardly otherwise do harm, unless when the aromatics are taken in such large quantity as to weaken the tone of the stomach in the manner we have mentioned above.

AFTER perusing what has now been said upon the subject of Aliments, some of my readers may perhaps allege, that in marking the difference of aliments, more nicety has been expressed than was necessary, as the most part of mankind do not either feel or perceive the effects of those differences of diet.

It is indeed true that the generality of mankind do not perceive the differences of diet very nicely; because man is of a nature suited to a great variety of functions, and therefore to a great variety of states and circumstances, and among the rest to a great variety of aliments.

To this the human œconomy is particularly well suited; and the common saying of *Sanis omnia sana*, to a certain extent, is well founded; but this does not supersede all attention to the choice of aliments. Men are still of different constitutions with respect to their powers of digestion, nor less different with respect to the irritability of their system, and are consequently variously affected by the same aliments; and this so much as to have produced the vulgar observation, that *One man's meat is another man's poison*. This indeed does not apply in many cases, and only very remarkably in the case of the idiosyncrasies, which occur in many particular persons.

With respect to the most part of mankind, the different effects of aliment are not very remarkable; and though some excesses may take place, they are often transitory, and unheeded: but it would be of consequence for men to know, that repetition may in time render these effects considerable and dangerous. It were well, therefore, that mankind were aware of the tendency which every kind of diet has to produce effects either immediately, or after repetition, unfavourable to health. It would, however, be difficult to give to the bulk of mankind the necessary instruction on this subject: and it would hardly be necessary to render it very universal; as it is not in many cases, and only in particular persons, that diseases arise from errors in diet. But it is absolutely necessary that physicians who have the whole of mankind as objects of their attention, should study this matter; without which they cannot either perceive the causes of diseases, or direct the means of obviating them. In this business, however, I have often found physicians very deficient, from their great ignorance of the nature of aliments, and of the principles which should lead to the proper and necessary distinction of them. To supply this deficiency, and to give the necessary instruction, the foregoing Treatise has been attempted; and though in some particulars it may be both imperfect and mistaken, I flatter myself that it gives the necessary principles more fully and justly than they had been given before; and at least points out the necessary speculations that must be entered into for ascertaining the nature of aliments more exactly. In all this I cannot have been too minute; and I cannot be of more service than by engaging physicians in a minute study of the subject.

A

TREATISE

OF THE

MATERIA MEDICA.

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OF EDINBURGH.

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A TREATISE, &c.

CHAPTER I.

OF ASTRINGENTS.

ASTRINGENTS are such substances as, applied to the human body, produce a contraction and condensation in the soft solids, and thereby increase their density and force of cohesion: If they are applied to longitudinal fibres, the contraction is made in the length of these; but if applied to circular fibres, they diminish the diameters of the vessels or cavities which the fibres surround.

The operation of astringents in general, in condensing the solids, appears from their use in the tanning or making of leather, in which they are so frequently employed.

The same operation also appears from their antiseptic power, which seems to depend upon their preserving the firmness and cohesion of the animal substances to which they are applied, for a much longer time than the firmness would have continued in these substances without such application.

By what means astringents produce the contraction of the solid parts of animal bodies, is not very evident. It does not seem to be by introducing a matter into their substance; and in some cases it seems to be rather by absorbing and abstracting their fluid parts. In some cases, where the substances applied are such as coagulate the fluids of the human body, as acids and alcohol, we can readily understand how the same should condense and contract the solids formed of the same fluids which those matters coagulate. It does not, however, appear that other astringents, void of acidity, act in the same manner; and their operation must be referred to an attraction taking place between these astringents and the particles of the animal solid.

In forming a table of medicines according to their several operations on the human body, it seemed proper to distinguish them as they operate upon the simple solid, which is much of the same nature in the dead as in the living body; or as they operate upon the sensible and moving solids, which have their qualities and powers only as they exist in a living body. This distinction, on many occasions, will be necessary and useful, but we cannot follow it throughout; and on these occasions, where the medicines at the same time operate upon both the simple and living solid, the consideration of their operation cannot be taken separately.

This is the case with respect to our present subject, as astringents often operate upon the solids of both kinds.—This indeed has not been always observed; and it has been commonly supposed, that astringents act more upon the simple than upon the

living solid: and therefore, that they act almost only on the parts to which they are immediately applied. A very learned physician in writing on hemorrhagy, has this expression: "I do not lay any great stress upon the use of internal astringent remedies, because it does not appear likely, from reasoning, that they should do any service: and I am far from being convinced by experience that they ever do, except perhaps in hemorrhagies of the *primæ viæ*." *Heberden in Med. Trans. Vol. II. 432.* This, however, I cannot hold to be just; and by the corrugation and constriction of the whole mouth and fauces, which happens from a small portion of astringents being applied to a small part of the tongue, I hold it to be demonstrated that astringents act upon the sentient nerves; and therefore that the astringent effects may be communicated from one part to very distant parts of the body. The same conclusion appears clearly to be formed from this, that astringents taken into the stomach show their effects in other parts of the body so quickly, that they can hardly be supposed to have passed further than the stomach itself; and therefore their sudden effects in distant parts must be ascribed to an astringent power communicated from the stomach to those other parts.

It may, indeed, be alleged, that the astringent matter is in some cases carried further than the stomach and into the course of the circulation: but it must still be observed that in many of those cases the quantity of matter introduced is so small, that when again diffused in the mass of blood, and equally distributed to the different parts of the body, it is obvious, that the portion of it applied to a particular part cannot be sufficient to produce any effect upon it; and therefore the effects which appear must be ascribed to the general operation on the stomach. Of all this doctrine, and particularly of the propagation of astringent power from the stomach to other parts, we have a strong proof in this, that some of the most simple astringents taken into the stomach very soon after prevent the recurrence of a paroxysm of an intermitting fever, which implies a very general operation on distant parts.

As it is, therefore, established, that astringents act upon the moving fibres, as well as upon the simple solid, it will be readily conceived, that to their operation on the former, their most considerable effects on the living body are to be ascribed. As they contract the moving fibres, and increase their force of cohesion, they must increase their contractility, or what I call their tone; and they are therefore, often properly named Tonics; and upon the same ground are fitly enough named Strengtheners or Roborants; which under these titles will be more fully considered hereafter.

The matter of astringents has been variously judged of, and generally supposed to consist of acid and earth. In the astringents of an acerb taste, such a composition seems to be evident; and the supposition is confirmed by observing that an astringent quality is produced by certain combinations of acid and earth as in

the case of Alum. We must not, however, conclude this to be a general proposition; as in many cases a combination of acid and earth produces matter of very little astringent power, as happens in the case of acids joined with calcareous earths; and in one case an acid joined with absorbent earth, as in magnesia alba, produces matter of a purgative quality. We cannot therefore admit of this general proposition, that astringents are formed by a combination of acid and earth. With respect to the greater part of the vegetable astringents, the presence of an acid is by no means evident; and it is certain, that in the greater part of them, the quantity of acid is not so much as to saturate the earthy or other parts of the matter in their composition: for the whole substance of the astringent appears still to be a powerful absorbent of acids capable of abstracting them from other substances with which they are joined, as we shall show more fully presently.

This leads me to say in what manner we discover an astringent quality to be in certain bodies.

In the 1st place, we discover it most certainly by their effects on the human body, and that by the taste they give in the mouth; a sense of constriction not only in the parts with which they come immediately in contact, but also in the whole of the internal surface of the mouth and fauces. This sense of constriction is different from different substances; and I believe its degree may be taken as a mark of the power which such substances may exert as astringents in the stomach, or other parts of the body.

In the 2^d place, we discover an astringent quality in bodies by their being applied to a solution of green vitriol, in which they produce a black colour. This we suppose to be owing to the astringents abstracting the acid of the vitriol from the iron it was before joined with; and that therefore the iron falls down in the form of a black powder. I shall not insist further on the theory of this operation, but shall endeavour to apply it to our purpose.

As experiments show that astringent substances applied to the solution of vitriol, produce more suddenly a black colour, and that of a greater degree of blackness, in proportion to the other marks they give of their astringency, so we may employ this experiment to determine the power of astringency in different substances. For this purpose the learned *Bergius*, in his late Treatise on the Materia Medica, has given us his experiments of the application of almost every vegetable substance to the solution of green vitriol; and I have much reason to believe, that his experiments have been accurately made and faithfully reported. From them, I think we learn what I have just now alleged, that the astringent power is in proportion to the suddenness with which they strike a black colour, and to the degree in which they produce it. By this the learned author points out what substances are the most powerful astringents; and in like manner, what are the weaker kinds of the many which formerly entered promiscuously into our lists of astringents; and I shall hereafter make use of

his experiments in determining the astringent power of particular substances.

But before I enter upon this, I think it proper to observe here, that every substance which strikes a black colour with a solution of green vitriol, is not to be considered as an astringent; for it may happen that a small proportion of astringent matter may be present in substances in which a matter of contrary quality truly prevails; and there cannot be a stronger instance of this than in the herb *Malva*, the juice of which strikes some black colour: and from the experiments of *Bergius*, it will appear that the same happens with respect to many other vegetable substances which have not been nor cannot be, considered as astringent matters.

A second observation to be made is, that certain astringents, which otherwise give proof of their astringent power, do not strike a black colour with the solution of vitriol, or do it more weakly than in proportion to their astringent powers. We have an instance of this in the juice of quinces, and some other acerb substances; which is probably owing to this, that the astringent matter in these substances is saturated with the acid that is already present in them.

What judgment, concerning the nature of vegetables, may be formed from the different colours which are produced by them when applied to the solution of vitriol remains yet to be inquired into.

The general effects of astringents on the human body are expressed above in the definition; but in what different states of the body, that is, in what diseases they are to be employed, is yet to be said.

In all cases of general debility they may be supposed to be useful; and in the state which has been called a *Cachexy*, and which often forms the beginning of dropsy, the preparations of iron formed by a combination of the acid with that metal has been employed with much benefit: but I do not know of any other simple astringent, that in the same case has been employed with advantage. In one case, their power in taking off the atony of the system is very remarkable, and that is in the case of intermittent fevers.—In another place, in my *First Lines of the Practice of Physic*, I have shown that the recurrence of the paroxysm of intermittent fevers depends upon the recurrence of a state of atony in the system, and that the paroxysm is prevented by various means of obviating the recurrence of that atony: and a frequent experience has showed the power of astringents in this respect. It is true, that, even for this purpose their tonic powers are much increased by their being combined with bitters, as we shall explain in another place; but in the mean time, as the most simple astringents frequently answer the purpose, it does not prevent our perceiving that astringents by themselves are capable of increasing the tone of the moving fibres over the whole body.

Astringents are considered as especially useful in restraining excessive evacuations; and, in the first place, hemorrhagies, or the evacuations of red blood; and I have no doubt of their being fitted for this purpose, or their truly answering it; but I must own, that there is no practice in which I have been more frequently disappointed than in the employment of astringents in the case of hemorrhagy. I ascribe my failure to this, that though astringents taken into the stomach give some increase of tone over the whole system; yet they are not powerful enough for producing such constriction in distant parts, as may be sufficient for overcoming the increased impetus of the blood in the vessels. This, however, I would assert with respect to certain astringents only, and allow that there may be in the different kinds more or less power of propagating their effects from the stomach to distant parts, as I shall endeavour to take notice of when treating of particular astringents.

On this subject I imagine it is proper to observe, that the different effects of astringents will depend on the nature of the hemorrhagy to which they are applied. Hemorrhagies may depend upon the increased action of the vessels forcing an opening or rupture in their extremities, or the same disease may depend upon a loss of tone in the extremities of the blood vessels, allowing them to be opened without any increase in the action of the vessels; and merely by the ordinary, or perhaps even a less than usual, impetus of the blood in them. In these two kinds of hemorrhagies the effects of astringents must be different. In the former, they may not only be ineffectual, but may be actually hurtful, by increasing the tone and action of the vessels; and it is only the latter case to which they are properly adapted, and can be useful, as will be better understood from the doctrine concerning Menorrhagia, which I have delivered in my *First Lines of the Practice of Physic*.

Astringents are also employed in restraining the excess of serious evacuations; and are therefore employed in the case of diarrhœa. Here their efficacy is evident; and will be readily accounted for by their being immediately applied to the parts affected. But it is extremely necessary here to take notice of an error very generally prevailing in writers on the materia medica in their relating the virtues and powers of astringents. They very generally mention the virtues of astringents as equally adapted to diarrhœa and to dysentery; but I maintain that these two diseases are very different from one another: so that while diarrhœa consists in an increased evacuation from the exhalents and excretories on the internal surface of the intestines, which may be restrained by astringents applied, the dysentery consists or depends upon an increased constriction in a considerable portion of the intestinal canal, which must be increased by the application of such astringents. This is now well understood; and practitioners very universally observe, that astringents are

not only ineffectual, but very hurtful in dysentery; and therefore we assert, that the marking of astringents as equally adapted to both diseases is a pernicious error.

Beside diarrhœa, astringents are said to be suited to the restraining of other serous evacuations; but I must say, that in practice I have been as much disappointed in these cases as in the case of hemorrhagy: and upon the same ground, that the effects of astringents taken into the stomach are not propagated so powerfully to distant parts as to produce the constrictions required in them. This I have had occasion to observe with regard to the *Leucorrhœa*, or Fluor albus. For the cure of this disease, I find forty remedies recommended by writers on the materia medica; but I have met with forty cases of it, in which not one of those remedies were of any service.

I believe the most part of practitioners have had occasion to observe the same inefficacy of internal astringents in the case of gleets, or serous evacuations from the urethra in males; and therefore will judge with me, that materia medica writers have been much too liberal in ascribing virtues to astringents in those cases. How far a distinction is to be made in those cases, with respect to different astringents, I shall consider hereafter.

It may be supposed by some, that there is an analogy between those cases of increased serous evacuations, and the excessive discharge of a serous fluid from ulcers; and, therefore, that to remedy this, internal astringents may be employed. I believe the propriety of this measure may be well founded; but at the same time, it does not appear that the good effects in these cases depend upon a constriction produced on the extremities of the vessels pouring out the fluids, so much as upon restoring the tone, perhaps the inflammatory state of the vessels, that is necessary to the production of laudable pus.

In mentioning the general effects of astringents, I must not omit their singular power of relieving the symptoms which attend the presence of a calculus in the urinary passages. Among the dissertations of *De Heucher*, formerly a professor at Wittemberg, there is one under this title, *Calculus per adstringentia pellendus*. In this he shows, that almost at all times, and by the most eminent physicians, astringents have been employed in calculous cases.—He is, indeed, intent upon showing that astringents have been employed in promoting the excretion of calculi; but I presume that, in the cases in which these remedies appeared successful, the calculus matter was only supposed to be evacuated, because the patient was relieved from the symptoms that he formerly laboured under. But we now know that these symptoms may be relieved without the stone's having been dissolved or evacuated: and among other medicines that may operate in this manner, astringents may, I believe, be reckoned. A proof of this appears in the use of the leaves of the *Uva ursi*; which not only from the experiments of the late *De Haen*, but also from my

own, I have found to be often powerful in relieving the symptoms of calculus. This plant is manifestly a powerful astringent; and in what manner this, and other astringents are useful in the cases mentioned, may be difficult to explain; but I shall offer a conjecture on the subject. I suppose their effect to depend upon their absorbing acid in the stomach. Their powerful attraction of acid we have mentioned above: and that thereby they may be useful in calculous cases, is rendered probable by this, that the medicines which of late have been found the most powerful in relieving the symptoms of calculus, are a variety of alkalines, which are known to do this without their acting at all in dissolving the stone.

When we have thus said in what diseases astringents are useful, it is proper to remark, that materia medica writers mark them as useful in a disease in which we would allege, both from theory and experience, that they are of no use at all; that is, in the case of hernia, which in our opinion does not depend upon any laxity of the intestinal canal, but upon the laxity of the containing teguments; to which we believe the operation of internal astringents can hardly reach.

After mentioning the diseases in which astringents are supposed to be useful, it is proper for me to observe that they are improperly employed in restraining evacuations, whether of blood or of serous fluids, when these evacuations can be truly considered as critical, or as necessary to relieve a plethoric state of the system, except when the evacuations proceed to an excess that threatens to be in danger of inducing death, or at least of inducing a great and dangerous debility. In such cases, the judicious practitioner will balance between the consequences to be apprehended; but we cannot miss to remark here, that the Stahlians, and other German physicians, by supposing plethora and cacohymy more frequently than they exist, have limited the employment of astringents too much.

Astringent matter is very generally present in the vegetable kingdom, and sometimes in all the different parts of plants; but most frequently in their barks, sometimes in the roots, more rarely in their leaves, and more seldom still in the flowers: though there are exceptions to all of these as general rules.

With respect to the pharmaceutical treatment of astringents, we in the first place observe, that they are most useful when they are taken in their entire state, and when given, as the common language is, in substance; and we are persuaded that the gastric liquor extracts them more powerfully than any other menstruum we could apply. It is, however, on many occasions, proper to employ them in a liquid form; and for that purpose they have been treated by distillation, infusion, and decoction.

Astringents very rarely consist of odorous or volatile parts. They are very universally of a fixed nature, and nothing rises from them in distillation with water; and even in those cases

where their odorous and volatile parts arise, it is found that no part of the astringent quality is at the same time communicated to the distilled water; and therefore the distilled waters drawn from astringents formerly kept in the shops, were on that account absolutely inert.

Astringents are properly enough treated by infusion, and readily yield their qualities either to an aqueous or spiritous menstruum. The extract obtained by water is in larger proportion than that obtained by spirit: but that the astringency is greater in the one than in the other is not certainly determined; and the choice of the infusions is made rather according as the menstruum is more or less adapted to the purpose of the medicine, than by any consideration of the astringent power extracted by it.

Astringents are also treated by decoction in water; and in this way a stronger impregnation can be obtained than by infusion: but it appears to me that the astringent matter is extracted in a more entire state of infusion, and that in decoction there is always some decomposition takes place; with what effect, however, on the substance as a medicine, we cannot certainly determine.

Having thus treated of astringents in general, I proceed now to give some remarks on the particular astringents that have been or may be employed, and that in the order of the general catalogue of medicines that has been prefixed.

PARTICULAR ASTRINGENTS.

BOLUS RUBRA.

THE bolus armena stood in our dispensatory lists long after we had ceased to import any such substance from the east; but it is now entirely omitted in our British catalogues.

A number of similar earths, under the titles of *Terræ Sigillatæ*, or sealed earths, still hold a place in foreign catalogues; but they are now entirely neglected in Britain, and we retain of the bolar earths, the *Bolus Gallica* only. This, however, I expect will also be expunged; for I cannot perceive in it any sort of medicinal quality. Applied to the tongue in a dry and powdery state, by absorbing the moisture of the part, they give some sense of austerity and astringency; but upon a more complete diffusion, that entirely disappears; and as they are not soluble in any of the animal fluids, I cannot believe in their exerting any astringent power even in the alimentary canal.

I have never found them of any use; and I must have better authority than that of the late *Dr. Hill*, to make me believe that they have ever been of service in diarrhœas and dysenteries. See *Hill's Materia Medica*, page 180. These earths discover no alkaline part in their composition that can be dissolved by vegetable acid; and therefore they cannot be useful as absorbents of acid in the stomach; and much less do they discover any acid that can be the foundation of *Dr. Boerhaave's* character of Lau-

-datissimæ boli. See Aph. 88. at the end of the paragraph. Nor can I find any foundation for the opinion of his commentator, *Van Swieten*, page 128, that by correcting putrid matters, they are useful in dysenteries attended with much putrescency.

CRETA.

Many physicians would introduce here this and many other absorbent earths, as they suppose these, when combined with acids, to prove astringent: but so far as I can judge by the sensible qualities of such compounds, their astringent quality is very inconsiderable; and the effects of absorbents in inducing costiveness, even when used very largely, we have not observed. Their effects, either in this way or in curing diarrhœa, if truly observed, we would ascribe rather to their correcting acidity than to their astringency. See what I have said above on astringents in general.

ALUMEN.

I do not think it my business here to give any account of the practices by which this substance is produced from several fossil matters, as this has been done already by several writers more scientifically than I could; nor do I think it necessary, after *Margraaf*, to give any account of the peculiar part of *Clay*, that, with the vitriolic acid, enters into the composition of alum. It is enough for me, that this is a substance very well known; and that in the same state in which it is employed in various arts, and as commonly exhibited in our shops, it is sufficiently pure and fit for the purposes of medicine.

Here we consider only its use in medicine, and chiefly as an astringent of the most powerful kind. It is used both internally and externally. With respect to its internal use, I am surprised to find that it seems not to have been employed with other astringents in diarrhœa. Some *Materia Medica* writers indeed, mention its being suited to cure this disease; but I have not met with any practical writer who prescribes it in such cases. Governed like other practitioners by imagination and habit, I have seldom employed it; but I have employed it so much as to make me judge that in diarrhœas it may be used with advantage.

It has been given internally, chiefly in the cases of hæmorrhagy from the lungs or from the uterus. In the case of hæmoptysis I have not found it useful; and this I believe happened from the hæmoptysis being always an active hæmorrhagy, in which astringents seem to be always hurtful. But in menorrhagia, and other uterine hæmorrhages, which often depend upon a laxity of the vessels of the uterus, it may be of service; and we have often found it to be so. It should be given at first in small doses, as it is ready to irritate the stomach; and in several instances I have found it rejected by vomiting; and what is more extraordinary, I have known large doses of it operate as a purgative. In urgent cases, however, the doses must be frequently repeated and

increased, for it has been only from large quantities given, that its effects have appeared to be considerable. We begin by giving it in doses of five grains; but have gone the length of a scruple, and have given such a dose several times in a day.

Alum has been frequently employed in the Fluor albus, and particularly on the recommendation of *Dr. Thompson, Medical Essays*, IV. 38.; but I have been very often disappointed of its effect. It was strongly recommended by *Dr. Mead* for the cure of diabetes: but in our hospital the serum aluminosum has been frequently employed in diabetes without success.

Among the other remedies of intermittent fevers, alum, joined with nutmeg, has been mentioned; and the analogy, with other tonic powers, renders it a probable remedy. I have tried it by giving a large dose of it an hour or a little more before the coming on of a paroxysm; and in some instances it has prevented this: But both the alum and nutmeg were disagreeable to the stomach, and prevented a repetition, when more agreeable and more certain medicines were at hand.

Since the time that *Helvetius* wrote *Des pertes de Sang*, and proposed alum as a specific for the cure of these, it was long common to employ alum in the form proposed by *Helvetius*; that is, as fused with a certain proportion of Sanguis draconis, supposed to be an astringent: but as this is a medicine not soluble in the human fluids, and therefore absolutely inert, it has been justly rejected. If, as *Dr. Lewis* supposed it to be, more slowly dissolved in the stomach, and therefore introducing the alum more gradually, it might be proper; but we are persuaded that the Sanguis draconis rather prevented the operation of the alum altogether: and if the slow introduction is to be studied, this may be obtained by smaller doses than even those above mentioned. The Edinburgh college have thought proper to continue the title of Pulvis Stypticus, that our practitioners had been long accustomed to; but they have added a more valuable astringent than the dragon's blood, that is, the gum Kino, which does not make in colour or dose, a medicine different from the composition formerly kept in the shops.

Alum is more frequently used externally than internally, particularly in gargles, in relaxation of the uvula, and other swellings of the mucuous membrane of the fauces, when there is not at the same time any acute inflammation present; but I have known it employed in every state of the cynanche tonsillaris with some advantage. In many persons who are liable to be affected with this swelling from slight applications of cold, we have known the disease prevented, or soon removed, by the use of a decoction of oak bark, to a pound of which half a drachm of alum and two ounces of brandy were added. The same gargle, without the spirits, is useful in the case of spongy swelled gums and loose teeth, from scurvy or other causes.

Alum is also useful in curing the ophthalmia membranarum,

and seems to me more powerful for this purpose than either white vitriol or sugar of lead. It is commonly employed in the form of coagulum aluminosum; but I have found the solution in water to be still more effectual, employing from two to five grains of alum to an ounce of water.

Burnt alum has been much employed as an escharotic for consuming proud flesh in ulcers; but it is not near so powerful as the preparations either of mercury or copper.

FERRUM sive CHALYBS, *Iron or Steel.*

The term Mars, introduced by the Chemists, is very frequently employed.

Both titles stand in the catalogue of the London College: and in preparing the rubigo, they seem to have preferred the chalybs: but on what foundation we cannot perceive. We suppose it to be quite indifferent whether the one or the other is employed; but if we were to give any preference, we should think it due to the iron in its soft malleable state, or in what we call Forged Iron.

As iron, like all other metals, in its solid and entire state, is not active with regard to our bodies, without being corroded or dissolved by saline matters, so we judge it to be rendered active only by being combined with acids. It has been common enough to give the entire metal, brought by filing into a fine powder, and with very good effects, as a medicine. This, however, we do not consider as any exception to our general rule: for we are persuaded that there is constantly present in the human stomach a quantity of acid capable of dissolving iron; and we hold this to be a proof of it, that we never knew iron given in its metallic or slightly corroded state, without producing a blackness in the stools, which to us always presumes a previous solution of the iron in acids.

As this combination with acids is necessary, so physicians and chemists have diversified this combination a hundred ways: and we do not know a preparation of iron for the purpose of medicine that has not been prepared by a combination with acids, or by bringing the iron into a state that rendered it readily soluble by the acid of the stomach; and *Dr. Lewis* very properly observes, that Prussian blue, though truly containing a quantity of iron, as it is not soluble in any acid, is the least promising of all the medicinal preparations.

I do not think it necessary to enumerate here the various preparations that have formerly stood, or still stand, in our dispensaries, as they all agree in the same medical virtue, and are only proper as convenient for being exhibited in different forms. The Edinburgh college have endeavoured to make an improvement in preparing a spirituous tincture, as the tinctures of that kind formerly prepared, were liable in keeping to let fall a portion of what they had dissolved, and of thereby becoming constantly weaker the longer they were kept. The college, as taught by *Dr. Black*, have obviated this, by ordering the tincture to be made of the squamæ ferri, as a portion of iron deprived of its

phlogiston, and therefore entering into a more strict union with the acid.

Iron combined with acids becomes an astringent substance ; and upon its astringent and tonic powers its medicinal virtues entirely depend : for by increasing the tone of the vessels it increases their vigour and activity.

We do not think it necessary here to take any notice of the doctrine of *Menghini*, concerning the iron constantly present in the blood of animals, or the manner in which it is introduced into it. We think it is enough to say, that his experiments both on men and brutes, show clearly that iron introduced into the stomach, and acting there, has the power of increasing appetite, and the vigour of the circulation.

Physicians formerly supposed that iron had a double power of sometimes increasing and sometimes restraining evacuations, and fancied that different preparations possessed these different powers : but in this they were mistaken ; as we have maintained above, that every preparation soluble in acids has the same astringent and tonic power ; and the *Croci* which were distinguished as aperient or astringent have commonly neither the one nor the other quality.

It is, however, still true, that the same preparation, as *Dr. Lewis* has judiciously observed, may sometimes exert an aperient and sometimes an astringent power, according to the state of the body it is applied to. If, for example, retention of menses depends upon a weakness in the vessels of the uterus, chalybeate medicines, by invigorating the force of the vessels, may cure the disease, and may thereby appear to be aperient : and, on the contrary, in a menorrhagia, when the disease depends upon a laxity of the extreme vessels of the uterus, iron exhibited, by restoring the tone of these vessels, may show an astringent operation.

By considerations of this kind, the inutility or propriety of the medicinal preparations of iron may be determined. In all cases of active hæmorrhagy, they must be hurtful ; and in cases of hæmorrhagy from external violence, I would judge them to be useless, if not hurtful. In cases of a general flaccidity, as it is frequently marked under the title of Cachexy, and in all cases of evacuations from laxity, whether sanguine or serous, they are likely to be the most effectual remedies.

We are persuaded that the good effects of the preparations of iron have been often missed by their being given in too small doses. The saline preparations, in large doses, are ready to irritate the stomach ; and both on this account, and on some other considerations, it may be always proper to begin with small doses, and to increase them by degrees : but we have often found, that no great benefit is to be obtained but when large quantities, either by the size of the doses, or by the long continuance of them, have been thrown in. We have found the simple rust as

effectual as any other preparation, and we have always found the stomach bear it better than any other. We begin with a dose of five grains, but increase it gradually to what the stomach easily bears. We have been informed of its being given to the quantity of six drachms in one day; but we have hardly found any stomach that would bear the third part of that quantity without much sickness. I think the stomach commonly bears it better by some aromatic being joined with it.

CUPRUM, Copper. By the chemists, *Venus*.

I have no doubt of putting this metal into the list of astringents; for though it possesses very strongly stimulant powers, which often prevent our perceiving its astringency, yet we can, by employing the milder preparations of it, or perhaps by preparing it so as to take away the whole of its stimulant quality, obtain its tonic effects.

The late *Baron Van Swieten* tells us, that he had met with a preparation of copper, in which the stimulant powers of it had been entirely taken away; and when taken into the stomach excited no nausea, but excited a certain thrilling *formicationem* over the whole body, extending to the very points of the fingers; and this medicine had proved useful in epilepsies, which I think is the same thing as if he had said it possessed, a tonic power. I have not yet discovered the method of making such a preparation of copper; and therefore I employ either a small dose of the blue vitriol or a combination of copper with sal ammoniac, which I consider as a milder preparation than the combination of the copper with an acid. I give the blue vitriol in the dose of a quarter or half a grain according to the age of the person; and in repeating the medicine twice a-day, I increase the dose to what the stomach will bear without vomiting, but allow it to go so far as to occasion some sickness and even nausea. This medicine continued for some time, has proved an useful tonic in certain cases of epilepsy and hysteria. On some occasions it has proved diuretic: and on some others anthelmintic. The combination of copper with an ammoniacal salt, I learned from the *Acta Naturæ curiosæ*: and first introduced it into the practice of this country; and it now stands in our dispensatory under the title of the *Cuprum ammoniacum*. In many instances it has proved a cure of epilepsy, and thereby discovered its astringent and tonic power. It is employed in the same manner as I have said above of the blue vitriol, by beginning with small doses of half a grain, and increasing these by degrees to what the stomach will bear. I find it commonly more manageable than the blue vitriol; and in many instances have carried the dose to five grains, and in some still further. In many cases it has proved a cure of epilepsy; but in many others it has entirely failed in being such. When, in the course of a month, it has not shown any good effects, I desist from its further use, as I suspect that large quantities of copper introduced, may, like lead,

prove hurtful to the body: and therefore, in cases of periodical epilepsy, after giving the medicine constantly during one interval, if the disease still continues, I afterwards give the medicine only for some days before an expected accession: and in this manner I have had success.

In using preparations of copper, we must consult the various writings on the use of copper-vessels in the kitchen, There have now been many published, and are well known. The facts they have related prove beyond a doubt, that copper introduced into the body to a certain quantity may prove very mischievous, tho' its violent effects may not at first appear; but when they do appear, they have been often fatal. What quantity of it is necessary to render it poisonous, I cannot exactly determine; but I know, that used in considerable quantity, in such doses as have been mentioned above, it has not discovered its deleterious effects: but at the same time, I am so well persuaded of its deleterious tendency, that it seemed incumbent on me to give the caution I have just now mentioned; and its escharotic powers when used externally, sufficiently confirm my suspicions.

The escharotic powers of the preparations of copper have been known and employed from the most ancient times for cleansing foul ulcers, and bringing them to discharge a laudable pus; but since the introduction of the use of mercury in the 16th century, the preparations of this have been more commonly employed. The operation of copper and mercury seems to be very much the same; and whether the one is preferable to the other, I cannot determine: but in some cases I have found the copper succeed, when the mercury before employed had appeared less effectual; but whether this depended upon any peculiar power in the one substance more than the other, or upon the different degree of acrimony in the different preparations employed, I am at a loss to determine: but think the surgeons ought to attend more particularly to this subject.

When the preparations of copper are applied to an entire surface, they manifestly discover an astringent power; and upon that footing they have been injected into the urethra in gonorrhœas and gleet; with what propriety it is not my business to determine here, the question being with respect to astringents in general, and not with respect to copper in particular.

The astringent powers of the preparations of copper have especially appeared in the application of them to the eyes; and we have known a weak solution of verdegris useful in restraining inflammation: but it is so ready to prove irritating to that sensible organ, that a great deal of nicety is necessary in the employment of it; and we seem to have a milder preparation in the aqua sapphirina. It is, however, absurd to order this preparation in such a manner as to allow the strength of it to be liable to much uncertainty; and the Edinburgh college have properly ordered it so as it may be brought to a standard. It has com-

monly been supposed, that the aqua sapphirina was suited to take off specks or opaque spots that appear upon the cornea, and which has been supposed to imply an escharotic power; but this certainly is seldom the case; and it seems to act only by an astringent power, diminishing the impetus of the fluids in the vessels which terminate in the opaque spot.

In another respect, the operation of the preparations of copper upon the eyes may be mistaken. It has been common to introduce a portion of verdegriis into the ointments which, in cases of ophthalmia, are applied to the edges of the eye-lids; and this may be supposed to be on the footing of astringents: but as the application is especially employed in cases of the ophthalmia tarsi, in which there is almost always some excoriation of the tarsus, it is probable that the verdegriis acts here as an escharotic.

PLUMBUM, *Lead.* Saturn.

The astringent powers of the saline preparations of this metal are not sufficiently ascertained; but at the same time it is equally well known, that all these preparations, and the vapours exhaled from the metal itself, or its calces, introduced into the body, discover a sedative power extremely noxious to the human system. It is therefore difficult to determine how far we can employ the astringent and tonic operation of this metal, and be at the same time secure against its deleterious powers, especially as these deleterious powers do not always immediately discover their operation, and very often only after they have long remained latent and unheeded in the body.

Thus, *Dr. Huntdermark*, formerly a professor at Leipsic, in the appendix to the 7th volume of the *Acta Naturæ Curiosæ*, has given us a dissertation *de sacchari saturni usu interno salutari*: and I have no doubt that the learned professor had, upon some occasions, found the saccharum saturni moderate the activity of the system in fevers; for it appears that other preparations of lead had formerly been employed in fevers by other practitioners: but hardly any body now will think that *Dr. Huntdermark*, or those other practitioners, were sufficiently aware of, or attentive to, the consequences to be apprehended; and therefore that they could warrant us in any case against these being very mischievous.

This seems to be so much the case at present, that hardly any practitioner will now think of employing any preparations of lead as internal medicines: but in proportion as the favour for these has declined, that for its external use has greatly increased. We are, however, at a loss to determine positively, what is its operation, or to explain in many cases where its effects are evident, how the supposed operations could produce them. It is the writing of *Mr. Goulard*, of Montpellier, that has raised these doubts. It is difficult to deny facts positively asserted; but we find in *Goulard's* writings, so many facts not confirmed by our own experience, so many marks of partiality to the medicine he

recommends, and so much frivolous theory by which he supports it; that his credit with me is indeed very little. I am much of opinion, that nobody can consult him with safety, without attending to the very judicious and ingenious criticism published on the subject by *Mr. Aiken*, of Warrington; and I am disposed to leave my readers to be most properly informed of the virtues of lead applied externally in lotion, poultice, or ointment, to *Mr. Aiken's* work. I have only this to observe, that *Mr. Aiken* seems disposed to think, that the saline preparations of lead externally applied, never enter into the system in such quantity as to affect the general system in the same manner as they commonly do when introduced by the mouth, or when the vapours of lead are applied. But *Dr. Percival* has given us a fact that may lead us to believe, that *Dr. Aiken's* opinion is not well founded: and we judge it to be very probable, that though lead applied to the entire surface can hardly enter in such quantity as to be noxious to the system; yet that when applied to an ulcerated surface capable of a promiscuous absorption, it may be taken in such quantity as to affect the general system.

ZINCUM, *Zinc*.

That the saline preparations of this metal act as astringents, we know very well from the operation of white vitriol, so very frequently applied to the eyes. It has been used in different proportions; and when in large proportions, it certainly proves very irritating: but it may certainly be used with great safety in a greater proportion than that of two grains to the ounce of water, as it is in the aqua vitriolica of the last edition of the Edinburgh dispensatory; and the London college seems to be of that opinion.

The flores zinci, as a matter liable to be corroded by the acid of the stomach, and thereby rendered active, have been lately, upon the authority of the late excellent *Dr. Gaubius*, introduced into frequent practice as an antispasmodic, or as I consider it, as an astringent and tonic. They have now been frequently employed here in epilepsy, hysteria, and some other spasmodic diseases, as the chorea, and others. In epilepsy, they never answer with *Dr. Gaubius* himself; nor have they, that I know of here, though given in much larger doses than he seems ever to have employed. In my own practice, I have not found them of remarkable benefit, nor do I find my fellow-practitioners giving a more favourable report; and in consequence the employment of them in practice here becomes less and less every day.

In remote parts of the country, in which the flores zinci were not to be had, I have frequently prescribed the vitriolum album; and in some cases with as good effect as in any of those in which I had employed the flores zinci. We cannot dismiss the subject without observing, that from the experiments of *Mr. Hellot*, it appears clearly, that zinc introduced into the body in a certain quantity, may prove a violent poison; and I leave it with practi-

tioners to consider what caution this should give in the large or long-continued employment of zinc as a medicine.

VEGETABLE ASTRINGENTS.

THESE are a very numerous set; and in the indigene plants of Britain an astringent quality is very general. Formerly a great number of them were employed in medicine, and as such stood in our dispensatory lists: but the astringent quality is in different plants in very different degrees; and those in which it is weak have been of late neglected in practice, and for that reason omitted in our lists. For the same reason, perhaps, I might omit them here; but both because their being omitted in practice is not always well founded, and because they still remain mentioned in materia medica writers of the latest date and best reputation, we shall think it necessary to take notice of some of them, if it were for no other purpose than to prevent students from being misled by the materia medica writers they might otherwise consult.

In arranging the vegetable astringents, as in every other class of medicines, I have thrown them together, as far as I could, according to their botanical affinities; that is, as they belong to the natural orders, as these are established by Linnæus, or by professor *Murray*. Where that could not be properly done, I have done it by their sensible qualities, and some other analogies; all which will appear from the catalogue prefixed, and which will give a clear view of the order in which I am to pursue my subject. I begin the present with considering the natural order of the Senticosæ; and taking these in the alphabetical order of the names under which they stand in pharmaceutical lists, I begin with

AGRIMONIA.

This is now omitted both by the London and Edinburgh colleges, but in no other lists that I have observed. It is still in every materia medica writer; and these have always, and do still favour it with more attention than we think it deserves. It has some astringent powers; but they are feeble, and should not hold the place of many which we know to be more powerful in every intention in which it has been, or could be, employed. If we did not know well the disposition of the most judicious writers on the materia medica to repeat after others, we should be surprised on finding *Dr. Haller*, and professor *Murray*, repeating after an author of so little credit as *Chomel*, that he had cured a schirrous liver by means of agrimony; and it seems equally frivolous in *Spielmann* to tell us, that *Forrestus* had by agrimony broke down a stone in the bladder, and brought it away in pieces with the urine.

I may have frequent occasion for such criticisms; but I doubt much if my readers will have patience to admit of them.

ALCHEMILLA.

I have inserted this for the same reasons I inserted the above, though this has still less than that pretensions to a place any where ; and I do not believe the authority of *Baldinger* will again bring it into use.

ARGENTINA.

The leaves of this entitle it to a place in a list of astringents ; but their qualities are weak, and they are therefore properly neglected in practice. Upon the credit of *Tournefort*, I have tried them in the fluor albus, but without success. I did not, indeed, always join with them, as he did, the broth of crabs ; but in some trials even with this my success was no better. The roots are very different from all those of the same order. They are more succulent, and have much sweetness, with some astringency, but without any of the rank flavour of parsnips, with which they have been frequently compared. From their saccharine state, we might presume upon their being nutritious ; and they have been often eaten when boiled, and on some occasions have supplied the want of other aliment. See *Lightfoot's Flora Scotica*.

CARYOPHILLATA.

The root of this is considerably astringent, with some aroma when it has been recently raised in the spring-season and from a dry soil. The sensible qualities of this root are not, however, so great as to lead us to suppose its powers in the human body to be very considerable. But see how we may be deceived in this respect. A Danish physician, supported by the testimony of some of the most eminent physicians of that country, has represented the roots of the caryophyllata as a powerful remedy in intermittent fevers : and besides enumerating many cases in which it had alone made a cure, he enumerates several in which it made a cure when the Peruvian bark had failed : and these experiments have been confirmed by that of other physicians in Germany and Sweden, particularly by *Weber*, professor at Kiel.

This is all very strong, and hardly any one at first sight would doubt of it : but some scepticism is to be admitted in such cases. It is acknowledged even by *Buchave* and *Weber*, that this root failed in several instances where the Peruvian bark proved a remedy. The Swedish experiments have not been so favourable as those of the Danes and Germans to the credit of the caryophyllata. With the former in very few instances it succeeded, and in very many it failed. Considering the fallacy of experience, and particularly the fallacy of the experiments given us by the inventors of new medicines, we must be doubtful of those made by the partizans of the caryophyllata, till further experience, free from the prejudices of the day, shall have been made, or till we shall have had a sufficient opportunity of making experiments for ourselves ; which, from the scarcity of intermittents in this city, we have not yet had an opportunity of making.

FRAGARIA.

The fruit of this plant has been, and will be, considered in another place. The virtues of the leaves and root, though the same with those of the order, are too inconsiderable to be taken notice of any where.

QUINQUEFOLIUM.

This is a plant supposed to have been known to *Hippocrates*, and employed by him, as it has been frequently since by others, in the cure of intermittent fevers. On the same footing as other astringents, we can readily admit of this; but the sensible qualities of the quinquefolium do not lead us to think that it is to be preferred, or that it is even equal to other plants of the same order.

ROSA.

This is of many different species, and the materia medica writers have treated of many of them in particular: but we can find little foundation for this; and it appears that those writers, from their partiality to a fragrant flower, have bestowed more attention upon the whole genus than their medical virtues deserve. All the species discover an astringency, which, agreeable to the principles of *Linnaeus* on the subject of colours, is most considerable in the red rose, and in these, as in their most austere state, before they are quite blown. But even in their most perfect state, the astringency is not so considerable as to give much efficacy in practice. The infusum and tinctura are elegant preparations; but their effects depend more upon the vitriolic acid added to them than upon the power of the roses.

With respect to the roses, the *syrupus e rosis siccis* is perhaps more powerful than the tincture. The practice has been to prepare this syrup with honey rather than sugar; but we cannot find any advantage to arise from the honey. The last edition of the Swedish pharmacopœia orders the *mel rosaceum* to be made without boiling; but that diminishes the astringent power of the medicine: and the pharmacopœia Danica neglect this power altogether, when they order the medicine to be made with the distilled water. Vinegar can hardly be impregnated with the astringent quality of the roses; and we think the *acetum rosaceum* to be hardly of more power than the simple vinegar.

The virtue of roses is supposed to be found especially in the conserve made of them; and it is sufficiently probable that they will have the greatest effect when they are given in substance, and in considerable quantity. Some strong testimonies are given of their effects in phthisical cases; and it is not improbable that astringents internally given may contribute to the cure of certain ulcers: but we must own that it is in few instances only that we have seen the considerable effects of the conserve of roses in cases of phthisis pulmonalis: and in the cases in which we have supposed it useful, it has always been joined with a diet of milk and farinacea, and gentle exercise in the open air.

So that it was uncertain how much was to be imputed to the roses: and this we think was also the case with *Cruger*, living upon barley-water and wheaten bread alone. We are clearly of opinion with professor *Murray*, that a smaller proportion of sugar would improve it as a medicine; that instead of three parts of sugar to one of roses, as in our dispensatory, it would be better with an equal part only, as in the Swedish; with one and a half, as in the Russian; or at most with two parts as in the Danish pharmacopœia.

If any of the species have any purgative quality, it is very inconsiderable; and the syrup prepared upon this supposition does not at all deserve the place it has so long had in our shops. The cordial and analeptic powers so often celebrated in roses, are entirely on the footing of other grateful odours, to be taken notice of elsewhere.

The fruit of the *rosa silvestris* is commonly taken notice of under the general title of *Rosa*; but that is not agreeable to our plan, and must be taken notice of elsewhere: but there is a production of the rose-plant, a fungus or gall growing upon it, known under the name of *Bedeguar*, which belongs to the title of astringents, as it is possessed of and celebrated for its astringent power; but it has hardly yet got a place in our dispensatories, and we are quite unacquainted with its powers.

TORMENTILLA.

This root, by its sensible qualities, and by its striking black with green vitriol, appears to be one of the strongest astringents of this order; and therefore it has been justly commended for every virtue that is competent to astringents. I myself have had several instances of its virtues in this respect; and particularly I have found it, both by itself and as joined with gentian, cure intermittent fevers; but it must be given in substance and in large quantities.

STELLATÆ.

APARINE.

This formerly stood in our dispensatory lists, but is now omitted in all those in which any correction has been attempted, and seemingly with great propriety. We expect, however, that at least materia medica writers will excuse us if we repeat any facts which have been asserted: and therefore I inform my readers that *Girolamo Gaspari*, a physician at Feltri, published at Venice in the year 1731, a small volume under the title of *Nuove et eruditi Osservazioni Mediche*: in which he tells us he had employed the aparine in scrophulous tumours and sores with great success, and that he had heard of others who had done the same; but this practice has not been taken notice of, or confirmed by any other writers that I know of; and in some trials that I have myself made, it has been of no service,

GALIUM.

The flowers of the *Galium luteum* have an agreeable odour and their taste very gentle, acid and astringent; but I am uncertain if what grows in this country is the same with what grows elsewhere. The acidity and astringency of our plants is very inconsiderable; and no pains which *Dr. Young* or I could take, found them to coagulate milk; and *Bergius*, in the Swedish plant, neither found any acidity, nor found it in three several trials to coagulate milk. He tells us also, in contradiction to *Borrichius*, that in distillation it afforded no acid; but I imagine his experiment was different from that of *Borrichius*, as this was without addition, whilst that of *Bergius* was with the addition of water. In the latter kind of distillations, an acid does not immediately arise, as it does in the former from almost every vegetable; and if *Borrichius* found an acid arise more readily from the galium than from the acetosa, we would ascribe it to the succulency of the latter, as plants give out always first their more purely aqueous parts.

With respect to the virtue of the flowers of the galium in epilepsy, though it has been asserted by several, I am very doubtful of their power; and in several trials they have entirely disappointed me.

RUBIA TINCTORUM.

The sensible qualities of this root do not give any favourable opinion of its medical virtues; and till lately it has not been much employed in practise: but within these fifty years, it has become remarkable for its effect in giving its colour to the bones of animals who are fed upon it. This, with its giving colour also to the milk and urine of animals, shows that its colouring matter is carried into the mass of blood in considerable quantity, and distributed through every part of the system; and if we can suppose any active powers in such a matter the circumstances mentioned would lead us to believe, that a matter so largely applied might be a very powerful medicine. We do not, however, find, that these powers have yet been ascertained; and the effects that large quantities of this root given to the brute animals have in producing great disorders in their system, must render us doubtful of its general salutary tendency. That it may promote urine, we can believe from the testimony of many authors; but at the same time from my own experience I can assert, that, in many trials for this and other purposes, such an effect is not constant, nor has ever occurred to me.

As to its power and utility in the cure of the jaundice, though it was employed by *Sydenham*, and formerly by the Edinburgh college, we pay no regard to it; considering the fallacy which has so generally taken place with respect to the medicines employed in this disease. As it takes so readily to the bones, it is speciously enough supposed that it might particularly operate upon these; and accordingly it has been recommended as a re-

medy in rickets, particularly by some French writers, who are with me of very doubtful authority. It does not, however, seem to have been known to the Italian practitioners, nor to *Dr. Boerhaave*, nor to his commentator: and in several trials we have seen made with it, its effects have not at all been evident. Of late it has come into some repute as an emmenagogue; and I have received some testimonies of its effects as such from some physicians of this country, whose judgment I very much respect; but in all the trials that I have made with it, it has failed: and I know of other practitioners in this country, who after several ineffectual trials made with it, have now entirely deserted its use.

V A G I N A L E S.

ACETOSA.

The acid juice found in the leaves of this plant is to be considered in another place; and it is the root only that can have a place here. This has some astringency, but too little to be employed in practice where so many more powerful are readily to be had.

LAPATHUM.

Under this title the leaves and roots of a number of different plants have been employed; and in their qualities and virtues approach nearly to one another. In the leaves there is more or less of acid, which we are to consider in another place; and in their roots there is more or less of astringency, which gives them a place here. Which of them are the most powerful astringents, we find it difficult to determine. *Dr. Alston's* account of the hydrolapathum is very strong, and appears to be well founded; but we know little of their employment in practice. The laxative quality supposed to be in some of them, we know from trial to be very inconsiderable; and the virtues of the oxylapathum for the cure of the itch, we know also from trials to be none at all. The decoction may, like that of other astringents, be usefully employed in washing old ulcers; but the lapathum does not appear to have any peculiar power in this respect.

BISTORTA.

This, both by its sensible qualities and by the colour it gives with green vitriol, and by the extracts it affords, seems to be one of the strongest of our vegetable astringents, and is justly commended for every virtue that has been ascribed to any other. As such we have frequently employed it, and particularly in intermittent fevers, and in larger doses than those commonly mentioned in materia medica writers. Both by itself and along with gentian, we have given it to the quantity of three drachms in one day.

Formerly the rheum stood in our list in this place; but as it is hardly ever employed for the sole purpose of astringency, and always or chiefly for its purgative quality, I have now referred it to what I think its proper place.

FILICES.

These comprehending what have been called the Capillary plants, form a natural order in botany ; and in medicine, show the power of a natural order, by having very much the same virtues. I have set down only two or three which had lately a place in our dispensatory lists, though in most of those of later date they are omitted.

ASPLENIUM.

The several species of this show a slight astringency ; for which however, they do not deserve to be employed. In other respects they show no active powers : and there is nothing more ridiculous than their having been so long considered as pectorals.

FILIX MAS.

The root of this plant has been long celebrated as an anthelmintic, but its sensible qualities do not promise much ; and as it has hardly ever been employed but with some drastic purgatives, it is therefore to me still doubtful if it has any specific power in killing worms either of one kind or another. We more readily enter into this opinion, because in several trials of it made in this country in cases of worms, the stomach bears considerable quantities of it without any uneasiness ; but when given by itself it had no sensible effects.

ACERBA.

I have set down a number of fruits that agree in their sensible qualities ; which are such as lead me to give them a place here among the astringents. They might also have had a place amongst the nutritia ; but they are very seldom brought to our tables ; and if at all employed, it is in medicine, as astringent substances.

This country affords few of them ; and therefore of several of them I have no exact knowledge of their qualities : but this country affords one of the most powerful of the whole, and that is the *Prunus Silvestris*, which I have often found an agreeable and useful astringent. It was formerly prepared as an inspissated juice ; but as in that state it is less soluble and less readily active, the preparation of it has been properly changed into the form of a conserve ; but I must remark that in this, both Colleges have, in my opinion, employed a larger proportion of sugar than is any way necessary.

SUCCI INSPISSATI.

Under this title I had formerly set down two particulars, the *Acacia* and *Hypocitus*, which are now no longer known in our shops ; and they seem to be properly neglected ; as by the accounts given of them they seem to have no peculiar properties ; and their power as astringents is no greater than what we can find in other substances more within reach.

TERRA JAPONICA.

The production of this drug, formerly not well ascertained, is now put beyond all doubt by the labours of the ingenious *Mr. Ker*. See *London Medical Observations*, vol. v. p. 148. This

substance is still frequently employed in practice, entering into several officinal compositions; and we judge it, when genuine, to be a powerful astringent: but whether it is so much more powerful than several British substances, as to engage us to employ this brought from a distant country, and very liable to be adulterated, we cannot positively determine.

Mr. Ker informs us, that this substance forms a considerable part of an ointment very much used in Indostan. The other ingredients of that composition are considerably astringent; and the whole leads me to make this reflection, that astringents are more frequently useful and necessary in ulcers than our surgeons have commonly thought; and that the use of them so frequently commended by materia medica writers, is not upon such a slight foundation as I have formerly been ready to imagine.

SANGUIS DRACONIS.

This I have left standing in my list, because it remains still in all our dispensatory lists, though it seems very doubtful if it deserves a place. As it is absolutely insoluble in watery menstrua, it may be doubtful if it be soluble in the animal fluids; and though it may be dissolved in spirits, and thus introduced into the stomach, the aqueous fluids which it meets with there, must immediately precipitate it into an inert substance. We are therefore, upon the whole, clear that it should be expunged from our materia medica list. See what we have said above in the article of Alum upon the subject of the Pulvis Stypticus.

KINO.

This is a new acquisition to the materia medica; and it has been adopted by the Edinburgh college as an officinal, but by no other college that I yet know of.

We are informed by *Dr. Fothergill*, that it is a gum which exsudes from incisions made in the trunks of a certain tree called Pau de Sangue, growing in the inland parts of Africa; but the botanical account of this tree we have not yet met with.

Both by its sensible qualities, and its striking black with a solution of green vitriol, we have grounds for supposing it is a powerful astringent: and we have found it prove to be such in several instances of diarrhœa. I am informed also by a good hand, of its having been useful in some uterine hemorrhagies, particularly those after child-bearing. In some cases of fluor albus I have been disappointed of its effects when employed by itself; but the Edinburgh college have properly joined it with alum in the pulvis stypticus: and this composition proves one of the most powerful astringents I have ever employed. We are clear that, in making the tincture, the kino may be taken in larger proportion than it is in the dispensatory. As we have this gum, it is in large proportion soluble both in watery and spiritous menstrua. The brandy tincture ordered by the Edinburgh college is a sufficiently agreeable and powerful medi-

cine; but in many cases the menstruum prevents its being given so largely as it may be in substance or in watery infusions.

CORTICES.

The astringent quality of vegetables is more frequently lodged in their barks than in any other part of them; and there are perhaps very few barks of a hard consistence, in which there is not more or less of an astringent quality. This quality, however, is often joined with others of a more active kind, which prevent their being used as astringents; and I have therefore set down in my list only a few in which a simple astringency prevails, and that of a powerful kind.

CORTEX GRANATORUM.

The strong styptic taste of this bark, and the black colour it strikes with green vitriol, show sufficiently its astringent power; and it is commonly supposed to be among the strongest of this kind. As at the same time it gives out such a large portion of its substance to water in infusion or decoction, it seems to be particularly fit for affording a liquid astringent; and I have frequently found it particularly useful in gargles, in diarrhoea, and in external applications. That it is so powerful an astringent, internally used, as to be more dangerous than others, I cannot perceive; and that it has ever had the power of suppressing the menses in females, seems to me very doubtful.

CORTEX QUERCI.

This is the bark that is considered as the most powerful of the vegetable astringents: and its universal use and preference in the tanning of leather renders the opinion very probable. Accordingly it has been much employed as an astringent medicine, and commended for every virtue that has been ascribed to astringents, either internally or externally employed; but except its degree of power, it has no peculiar qualities to distinguish it from other astringents. I have frequently employed the decoction with advantage in slight tumefactions of the mucous membrane of the fauces; and in several persons liable upon slight application of cold to a prolapsus uvulæ, and a cynanche tonsillaris. In many cases, this decoction, early applied, has appeared useful in preventing those disorders which otherwise were wont to arise to a considerable degree. I have indeed almost constantly joined a portion of alum to these decoctions; but I have frequently found that a solution of alum alone, of the strength it could be conveniently employed in, did not prove so effectual.

I have employed the oak bark in powder, giving it to the quantity of half a drachm every two or three hours during the intermissions of a fever; and, both by itself and joined with camomile flowers, have prevented the return of the paroxysms of intermittents.

All these virtues, in a considerable degree, are found to belong to the cupula, or scaly cup, which embraces the bottom of the acorns.

GALLÆ.

Although these substances are the work of animal, we consider them as entirely of a vegetable nature, and put them here immediately after the oak bark, as they are an excrescence from the same tree, and a substance of the same qualities with the bark we have been just now treating of. It is supposed to be the most powerful of vegetable astringents; and I am ready to believe it to be so, though it has not been employed so often, or in such a variety of cases, as many others have been. About the beginning of this century, in some parts of France, the Gallæ had got a reputation for the cure of intermittent fevers; and it was pointed out as a proper object of attention to the Academy of Sciences; who accordingly appointed *Mr. Poupart* to inquire into the matter. His report may be seen in the memoirs of the year 1702. It amounts to this, that in many cases the galls cured the intermittents; but that it failed also in many cases in which the Peruvian bark proved effectual. *Bergius* is of opinion, that the practice with the galls is very mischievous; but in employing them with gentian or other bitters, I met with no bad consequences.

In this country, of late, a particular use of galls has prevailed. Finely powdered, and mixed with eight times their quantity of hog's lard, they are made into an ointment: which, applied to the anus, has been found to relieve hemorrhoidal affections; and we have known some instances of its being useful.

As, however, it has been more frequently employed by the vulgar than by the advice of our physicians and surgeons, we cannot say how far it has been universally safe; but so far as I can learn, it has not been commonly hurtful: and there is reason to believe it to have been certainly useful in the cases of Exania, that is, in cases of a topical rather than of a systematic affection.

VISCUS.

Though it is pretty certainly established that the mistletoe does not differ in its qualities from a difference of the trees on which it grows, yet, if it was to be mentioned at all, I thought best to do it in this place, as it is almost always, the viscus quernus that has been pointed out by writers.

Although, upon the recommendation of *Colbatch*, this plant was not very long ago in high repute for the cure of epilepsy, his facts have so entirely lost their credit, that it is entirely omitted, both by the London and Edinburgh colleges. As still, however, remaining in the lists of several of the lately improved pharmacopœias, we have given it a place here. It is, however, only to say, that from its sensible qualities, and from several trials made with it in practice, it seems to be a substance of very little power in medicine.

I am surprised at *Dr. Haller's* quoting so many authors for the accounts of its virtues; and humbly think that he might not only have omitted the reports of its effects against the power of witchcraft, but also many of the others which he quotes.

LIGNUM CAMPECHENSE.

This wood is of a considerably astringent quality, and its use in dyeing is a sufficient proof of it. It has not, however, been employed except in the case of fluxes, and is alleged to have been very useful in dysenteries: but we judge this to have been at the end of these only, when the disease was in the state of diarrhœa; for it was from the employment of this very medicine in the beginning of dysenteries, that I learned what mischief arose from the use of astringents in the beginning of that disease.

It is employed in decoction or in extract; and it was in both shapes that I observed it to have the effects just now mentioned. *Dr. Alston* has given this opinion, that if the lignum campechense be useful in fluxes, it is not by its astringency: but upon what that opinion was founded I cannot perceive; for it is certainly an astringent, and I cannot discover any other quality in it by which it can be medicinal.

In the table of medicines which I made out for my lectures on the materia medica, and which was published with the spurious edition of those lectures, after throwing the astringents into assortments as well as I could, I set down a number of substances which I could not refer to any general heads; and I was then, like many other persons, treating of the materia medica, willing to multiply my subjects: but now, not willing to admit any but those of some power and efficacy, I have omitted a great number of my former list; such as the *Anchusa*, *Brunella*, *Hypericum*, *Plantago*, *Sanicula*, and *Sedum*, as not deserving a place here. Some of the others, as the *Millefolium* and *Uva Ursi*, I refer to other titles; and therefore of my former list there remain only the few following to be taken notice of here.

BALAUSTIA.

These flowers discover no other quality than that of astringent; but they shew this in a considerable degree. I am however, of *Bergius's* opinion, that they are less powerful than the bark of the fruit.

LYTHRUM.

This had been hardly known as a medicine till the late *Dr. De Haen* published his experience of it, in his *Ratio Medendi*. His testimony in its favour is very strong, and it is confirmed by some others. Mark, however, the fallacy of experiment: Professor *Murray* found it useful in the case of lenty; but in other cases it seems frequently to have failed: and *Heuerman*, in employing the flowers, found it rather to increase the diarrhœa, and otherwise to raise so much disorder, that he ceased to employ them. From the sensible qualities of the whole, either with respect to astringency or mucilage, I would not expect much from it; and, from some trials made, I have no opinion of its efficacy.

After thus enumerating particular astringents, I have set down in my list some general titles of medicines that have a

place elsewhere, but which may be, or are supposed to be, useful as astringents. And, in the first place,

ACIDS, as *Astringents*.

Acids have a very various and complicated operation, according to their different degrees of concentration, which will be considered when we come to treat of them in their proper place; and here we are only to view them as they belong to our present title of astringents.

Acids, under a certain degree of concentration, as they coagulate the fluids, so they harden the solids composed of these, and thus prove astringent. Whether, however, the astringency which they shew even in a very diluted state, depends upon their coagulating power, I dare not assert; for they certainly shew it in a state in which they do not coagulate the fluids. Although, from the effect of vinegar upon the lips, we can readily discover their astringent power, yet how this is consistent with a stimulant power, which the same state of acid always shows, we cannot readily say, but shall consider it hereafter.

The astringent power which acids exert upon the vessels of the skin is supposed to go deeper, and to affect the subjacent muscular fibres so far as to be useful in recovering the relaxation and weakness that takes place in the case of sprains. I believe, however, that their operation in this case is only by a communication from the vessels of the skin to those of the subjacent parts; by which they are useful in preventing the afflux of fluids to the parts, and the tumour that would thence arise: and it is in this manner that they are particularly useful in contusions.

The acid commonly employed for these purposes is vinegar: but whether a more concentrated acid might not be employed, I cannot certainly determine. From some trials, however, I am disposed to judge that the fossil acids under a certain degree of dilution might be employed with advantage.

In another view, acids are supposed to act as astringents, as they are employed internally for restraining hemorrhagy: and practitioners have frequently found them in this manner useful. But considering the quantities in which only they can be introduced, as we cannot suppose that they are so distributed in the mass of blood as that they can act as astringents upon the open blood-vessels; and therefore their effects here must be ascribed to their refrigerant power, to be considered more fully hereafter.

Although not mentioned in my present catalogue, there are some titles given in that annexed to the spurious edition of my lectures which it may be proper to repeat here.

AUSTERE WINES.

This title only lead me to observe, that acids, joined to astringents, produce the qualities of austere and acerb; and in certain cases seem to increase the astringency. Wines, therefore, which have some austerity, are justly supposed to be more astringent than the smooth and sweet wines. From hence there

may be a choice of wines in certain cases of disease; but the astringent power of wines can never be considerable, and must be generally counteracted by the alcohol that is at the same time present. It is therefore that, to obtain the astringent virtue of wines, they must be exposed to such a heat as may dissipate their alcohol while their astringent matter remains; and thus what are called Burnt Wines, joined with the aromatic astringency of cinnamon, sometimes prove an useful medicine.

BITTERS, *as Astringents.*

Bitters certainly do sometimes show the effects of astringents; and therefore I judge it proper to mention them here: but how far they are, or in what manner they act as, astringents, I refer to be considered in my next chapter, which is to treat of tonic medicines.

SEDATIVES, *as Astringents.*

Every body knows that sedatives, and particularly opium, are employed in restraining excessive evacuations: and therefore this has been supposed, and frequently spoken of, as an astringent. Certainly, however, neither in opium, nor in any other narcotic sedative, can any astringent quality be discerned; and there is hardly any doubt that their operation in restraining excessive evacuations is entirely by suspending the irritability and action of those moving fibres, whose increased action produced the evacuation. How far they are properly employed in place of the proper astringents, I shall consider hereafter, under the title of Sedatives.

There is another kind of sedatives, which are frequently employed for restraining excessive hæmorrhagy, and might therefore also be considered as astringents. These are the several neutral salts, and particularly nitre; all of which I am to consider hereafter, under the title of Refrigrants. In the mean time it will be plain, that their operation in restraining hæmorrhagy, cannot be ascribed to any astringent quality, which they do not in any way discover; but must be owing to their general power of diminishing the activity of the sanguiferous system, which we shall consider in its proper place.

BALSAMICS, *as Astringents.*

Balsamics have been employed for restraining the evacuations that occur in gonorrhœas, gleet, and fluor albus; and therefore shew the effects of astringents. It will be obvious, however, that they do not effect this by any proper astringent power: and in what manner they do it, I shall endeavour to explain in its proper place hereafter.

CHAPTER II.

OF TONICS.

THE treating of these here breaks in upon our general plan of considering separately the medicines which act upon the simple solids, and those which act upon the nerves and moving fibres; but I have found that such a plan could not consistently, or with advantage, be every where followed; and that in some instances it would be better to consider medicines by the affinity of their effects, rather than by their manner of operating.

It is this that has led me, after considering astringents, to treat here of tonic medicines; which, by giving firmness and strength to the whole system, and thereby to peculiar parts, have an effect analogous and similar to that of astringents: and I shall have occasion to observe, that by the astringent and tonic power combined, some of the most valuable purposes of both are with greater certainty to be obtained.

We enter, therefore, now upon the consideration of tonics: and shall, in the first place, enquire a little into their manner of operating; in the next place, consider the effects that are in common to a great number of them; and, in the third place, treat of the pharmaceutic treatment and administration which may also be in common to many of them. After all this, I shall enumerate the chief of the substances that may be referred to this head, in order to determine in what degree they possess the general properties, or what may be peculiar to each of them.

We have already taken pains to show, that the tone of the moving fibres may depend partly on the mechanism of these fibres, but probably also upon the inherent power or state of the nervous fluid, as particularly modified in those fibres. If this last position be well founded, it will follow, that, whilst on different occasions the tone of the moving fibres may be stronger or weaker, this may depend upon the state of the nervous power in the moving fibres being for the time different; and as this power may be acted upon and variously changed by substances applied to the body, we may allow that there are substances, which, applied to the moving fibres, may induce that state of the nervous power upon which their tone depends.

Astringents, we have observed, often prove tonics with regard to the moving fibres; and it will be readily presumed, that they have that effect by acting upon the solid part of the fibre: but we shall find, that there are tonic medicines which discover no astringent quality; and therefore their action must be upon the inherent power.

These are the substances which are especially to be called Tonics: and I now proceed to enquire what these substances properly are.

With respect to this, it appears pretty clearly, that the tonic

power of substances is chiefly the same quality that gives them their bitter taste: for, excepting the astringents, I know no other substances possessed of tonic power, but the bitters. These indeed have frequently other qualities combined with the bitter; as that of aromatic, saline, narcotic, purgative, or otherwise variously stimulant: and these other qualities are often so prevalent in the composition of certain substances, as to prevent our employing their bitter quality as a tonic: but we can, upon many occasions, distinguish the bitter from all these other qualities, and find that the purest bitter, or what is free from all other qualities, is possessed of a considerable tonic power: and therefore we conclude, that except in so far as astringents may be such, the proper tonics are the bitters, and perhaps these only. We go on, therefore, now to consider them as such.

Bitterness is a simple perception that cannot be defined, but must be referred to a matter of experience in which mankind are commonly agreed. What is the nature of the substances possessed of it, in a chemical view, we cannot determine, or at least we can only in a negative way distinguish it from other matters.

Thus we can say, that bitterness does not depend upon any volatile parts, for the purest and strongest bitters have no smell; and if there are some bitters which give a smell, that again is commonly lost on drying, while the bitter taste and quality remain entire.—In another view, the bitters are without volatile parts; as the purest kinds of them give out in distillation no essential oil: or if some of them do, the oils are without bitterness, and show very clearly, that the bitterness of the entire substance did not depend upon the essential oil in their composition. We learn also, otherwise, that bitterness does not depend upon any such oil in the composition of their substance; as some of the strongest bitters are quite free from any acid or aromatic quality.

Neither can I find any thing distinctly saline in the composition of bitters. There are hardly any of them which to our taste discover any saline matter, except in a few substances, in which some acid happens to be conjoined; but the strongest bitters are absolutely free from any such quality: and so far are acids from entering into the composition of the bitter, that we shall hereafter show the combination of acid to have a tendency to destroy the bitter quality. With respect to any other saline matters to be alleged in the composition of bitters, it is true, that by particular processes, saline matters can be extracted from bitter substances; but as these saline substances are not extracted, but produced by a destruction of the original mixture, and as nobody has shown that the saline matters are in any certain proportion to the bitterness of the subject, or that they modify it in any certain manner, we cannot make use of any such analysis in explaining the natural composition of bitters.

Upon the whole, I must allege, that in a chemical view, we cannot explain the nature of bitters. It is a composition *sui ge-*

neris, that we can in many cases distinguish from all others : and if in any case we have learned to change its condition, it is from particular experience, and not from any knowledge of its constituent parts.

Before we enter upon what experience has taught in this respect, it will be proper to consider the various purposes in medicine to which bitters may be applied. And as in this view the bitters, in their operation on the human body, have many of them the same qualities and virtues in common, we think it may be useful to consider, in the first place, what these common qualities are.

First, then, the most obvious operation of bitters is, that being taken into the stomach, they increase the appetite for food, and promote the digestion of it. But we take it for granted, that these functions depend upon the tone of the muscular-fibres of the stomach ; and therefore may suppose that the improvement of these functions depends upon an increase of tone in those fibres. And farther, as loss of appetite and indigestion can often be distinctly perceived to occur from a loss of tone in the stomach ; so bitters, as they are often effectual in curing these disorders, may be presumed to do it by restoring the tone of this organ.

The correcting the acidity and flatulence of the stomach, may be ascribed to the power of bitters in checking acescent fermentation, which they do out of the body : and the relieving the stomach from abundant mucus or phlegm, as it is called, may be ascribed to the power of bitters in dissolving viscid animal fluids. As it is, however, probable that both the prevalence of an acescent fermentation in the stomach, and a superabundance of mucus in it, are commonly owing to a loss of tone : so the correction of those disorders may be ascribed more properly to the tonic power of bitters, with respect to the human body, than to their chemical qualities.

There is, then, hardly any doubt that bitters are powerful tonics with respect to the stomach ; and there being as little doubt that the state of the stomach is commonly communicated to the other parts of the system : so it is sufficiently probable, that by an improvement of digestion, the vigour of the system may be in general improved : and that also the tone, and consequently the activity of the whole of the moving fibres, may be increased.

It has been commonly supposed, that bitters are useful in resolving visceral obstructions : and if they shall be found to be so, I would maintain that they have no considerable operation upon the state of the fluids ; and therefore that their effects in curing visceral obstructions must be ascribed entirely to their tonic power ; although it may not be improper, by the way, to remark here, that in all cases where I could find the existence of visceral obstructions well ascertained, I have seldom or never found any benefit from bitters, though largely employed.

On the same occasions that *materia medica* writers recom-

mend bitters as useful in visceral obstructions, they particularly recommend and extol their use in the jaundice: but that the judgment of these writers in this matter is fallacious, we have endeavored already to show.

In speaking of the power of tonics in resolving visceral obstructions, we must observe, that upon the tonic power of bitters, in strengthening every where the extremities of the vessels, is founded their utility, so frequently reported in the cure of dropsy. As this disease so frequently depends upon a loss of tone in the whole system, which gives the state of cachexy, and thereby that laxity of the exhalents which constitutes the hydrophic diathesis; so if such a state does not depend upon some considerable and fixed visceral obstructions, it is obvious, that our tonic bitters may be of great service, may obviate a coming on dropsy, or even cure it when formed.

It has been alleged, that bitters sometimes operate as diuretics. And as the matter of them appears to be often carried to the kidneys, and to change the state of the urine, so it is possible that in some cases they may increase the secretion: but in many trials we have never found their operation in this way to be manifest, or at least to be any ways considerable. In one situation, however, it may have appeared to be so. When in dropsy, bitters moderate that exhalation into the cavities which forms the disease, there must necessarily be a greater proportion of serum carried to the kidney; and thereby bitters may, without increasing the action of the kidney, seem to increase the secretion of urine.

That the tonic power of bitters in the stomach is communicated to the other, and even the most distant parts of the system, appears strongly from their being a cure of intermittent fevers, and a special means of preventing the return of their paroxysms.

I have explained elsewhere, and need not repeat here my opinion, that the recurrence of the paroxysms of intermittent fevers depends upon the recurrence of an atony in the extremities of the arterial system. It is from hence accordingly, that the recurrence of paroxysms is prevented by stimulants and by astringents; and if the same is also done by bitters, it must be a tonic power communicated from the stomach to the most distant parts of the system. In this case, however, the bitters do not act as stimulants; for they do not increase the frequency of the pulse, nor the force of the circulation: nor do they act as astringents; because they do not always possess any such quality; and therefore they must in such cases act purely as tonics.

To prove the operation of tonics in curing intermittents to be an operation on the nervous system, we maintain it to be a communication from the stomach; for their effects, after being taken in, often appear sooner than they can be supposed to be carried further than into the stomach, and certainly sooner than the

quantity employed can be distributed, so as to have any local effects on the parts affected by the morbid state.

It may be remarked here, that the effects of bitters are more certainly obtained by their being combined with astringents, which, however, does not derogate from the power of the simple bitter; for from my own experience, as well as from the report of other writers, I know that the most pure and simple bitters are often sufficient for the purpose.

They are by some writers said to have been useful in continued fevers. And if these fevers have been of the putrid kind, and attended with great debility, we may readily allow the fact; and the same reports of their having been useful even in the plague itself are probably well founded.

Their use, however, in continued fevers is somewhat ambiguous, as tonic medicines must promote the phlogistic diathesis of the system; and therefore, wherever such diathesis prevails, our tonics must be hurtful.

Bitters have been sometimes spoken of as sudorifics; and though they do not stimulate the sanguiferous system, yet as they invigorate the force of this system, they must determine it more fully to the surface of the body, and probably support perspiration. But so far as I can perceive, they never occasion sweating, except by the assistance of a sudorific regimen, that is, by their being taken in a very diluted state, considerably warm, and in considerable quantity, while the person lies a-bed, closely covered up.

In mentioning the operation of bitters on the stomach, I should have taken notice of their effects when further carried on in the alimentary canal. And with respect to these, it may be observed, that we have always found a large dose of bitters prove pretty certainly laxative; and this with the analogy from bile, makes me judge, that bitters, besides their tonic power, have a peculiar power of stimulating the intestinal canal: and, therefore, that they may be useful, as is alleged, in spasmodic colics, or in dispositions to that disease, and particularly that they may be useful in dysentery; in which some constriction of the intestines taking place, renders purgatives and laxatives so generally necessary.

Another virtue ascribed to bitters is, their proving emmenagogue; but I have never perceived that they had any specific power determining them to the uterus. In case of a chlorosis, their tonic power is certainly useful: but I have never known that these alone afford a cure.

Several writers take notice of bitters in general, and of some of them more particularly, as resolving the coagulations produced by falls and contusions. But as we do not believe in their power of changing the state of the fluids, so we cannot trust to their operation in this case; and I have not met with any experience to establish it.

There remains only one operation of bitters internally em-

ployed; and that is, their proving anthelmintic, and a poison for worms. There is one instance reported of their even mitigating the pains arising from a tænia; but we do not find any account of their ever expelling that kind of worm. It is said to be the lumbrici teretes to which they are especially adapted; but from *Redis's* experiments it appears, that bitters are not an immediate poison to those animals: and Professor *Murray* properly observes, that if the semen santonicum, according to *Baglivi's* experiments, operates more quickly, it must be by something else than its bitterness that this seed operates. I am uncertain if I have even been possessed of the best kind of this seed; but must say, that what I have seen has hardly ever appeared to me to be a powerful medicine.

After considering, in so many instances, the internal use of bitters, we must observe, that they have also their virtues when externally employed. They have been commended for cleansing and healing foul ulcers; and in that way we have found them useful. They are certainly antiseptic, though not of the most powerful kind; but in checking the progress of gangrene, they have often been useful.

They are universally employed in fomentations for discussing tumours: but in cases where the skin is entire, the more pure bitters which have no volatile parts, can hardly be of much service. It is therefore the bitter, joined with some aromatic parts in their composition, which only can be useful here; and if even these can do much more than warmth and moisture alone, is with me very doubtful.

The operation of bitters hitherto considered seems, so far as they go, to be tolerably explained. But there is an effect of them still to be mentioned, which gives more difficulty; and that is, their being a cure of the gout that has been often ascribed to them.

The fact is certain; and there are accounts from the time of *Galen* to the present, which show that the use of bitters, such, for example, as the Portland powder, continued for some time, has prevented the return of paroxysms of inflammatory gout, which had before, in the same persons, been frequent: but in what manner they do this, is truly difficult to explain.

The pathology of the gout under its various states and circumstances, is truly a difficult subject; and except it be *Dr. Stahl* and his followers, all other physicians, very universally attached to a humoral pathology, have supposed the gout to depend upon a peculiar morbid matter present in the body; which, however, is neither proved in fact nor explains the phenomena of the disease.

In my *First Lines* I have given a different view of the subject; but am afraid that, to the most part of physicians, little attentive to the motions of the nervous system, I have involved the subject in still greater obscurity. I cannot, indeed, obviate this here; but well persuaded of the truth of the general doc-

trine, shall try it, by endeavouring to explain in what manner bitters operate in seemingly curing the gout.

I believe it to be very evident to every body, that the phenomena of the gout have a constant connection with the state of the stomach; and particularly that a certain strength of tone in this organ is necessary to produce a paroxysm of inflammatory gout. At the same time, however, I am of opinion with *Dr. Sydenham*, that every paroxysm of inflammatory gout is introduced by a state of atony in the stomach. How this atony gives occasion to the recovery and exertion of tone, I cannot indeed explain; but as it appears in fact to be so, I would allege, that though the previous atony be a necessary step in the series of phenomena, it is only when in a moderate degree, and may be easily overcome by the *vis medicatrix naturæ*; but that if the atony go to a certain greater degree, no inflammatory paroxysm ensues; and the person remains in that state which I have called the atonic gout; and it seems as if bitters, long continued in use, actually produce this greater degree of atony, so that they prevent inflammatory paroxysms.

This is the explanation I would give of their effects in this way; but I own it is difficult to explain how bitters, which are otherwise in so many cases the most powerful tonics, should have in this a contrary operation. Without venturing, however, to offer any theory of this, I rest upon it as a matter of fact, that bitters actually destroy the tone of the stomach. I dare not determine, whether the loss of tone mentioned is produced merely by the repetition of their tonic operation, or by a narcotic quality, which has been suspected in wormwood and other bitters, and which appears pretty strongly from the poisonous quality that is found in the strongest bitter we are acquainted with; that is, the *Faba Sti Ignatii*. I am truly of opinion, that somewhat deleterious in the whole of the bitters is to be suspected. But I prosecute this subject no farther here; and shall rather enter upon a question of more importance, which is, to determine whether this remedy for curing the gout can be safely employed.

On this subject it appears clearly, that, from very ancient times down to the present, such a medicine has at different periods been recommended and employed for the gout; and, as always on its first coming into use, it seems to have been of service, it might have been expected, that if it had not in its consequences been found hurtful, the use of it would have been continued with every gouty person: so that this disease should have long ago ceased to be one of the *opprobria medicorum*. We find, however, that whilst at one period it has been in high favor, at another it seems to have been entirely neglected; and this I can only impute either to its often failing, or to its being often attended with consequences more grievous than the pains of the gout. That the latter was the case, we may presume from the accounts of the ancients, who, though they recommend the re-

medy in certain constitutions as highly useful, allow that in other cases it had been highly pernicious; and in this respect I would take the account of *Coelius Aurelianus*, as quoted by *Dr. Clephane*, to be very general.

The effects of it in modern times have been very much upon the same footing. It is possible that several persons may have taken the Portland powder, and other bitters, with seeming great advantage; but I have not had opportunity to know the sequel of the whole of such persons' lives, so as to say positively how far, in any case, the cure continued steady for a life of some years after, or what accidents happened to their health.

But I have had occasion to know, or to be exactly informed of the fate of nine or ten persons who had taken this medicine for the time prescribed, which is two years. These persons had been liable for some years before to have a fit of a regular or very painful inflammatory gout, once at least, and frequently twice, in the course of a year: but after they had taken the medicine for some time, they were quite free from any fit of inflammatory gout; and particularly, when they had completed the course prescribed, had never a regular fit, or any inflammation of the extremities for the rest of their life.

In no instance, however, that I have known, was the health of these persons tolerably entire. Soon after finishing the course of their medicine, they became valetudinary in different shapes; and particularly were much affected with dyspeptic, and what are called nervous complaints, with lowness of spirits. In every one of them, before a year had passed after finishing the course of the powders, some hydropic symptoms appeared, which gradually increasing in the form of an ascites or hydrothorax, especially the latter joined with anasarca, in less than two or at most three years, proved fatal. These accidents, happening to persons of some rank, became very generally known in this country, and have prevented all such experiments since. In illustration and confirmation of all this, see *Dr. Clephane's* Observations, in *London Med. Observ.* vol. i. art. 14. *Chirurgical Pharmacy*, page 341. *Halleri Epistola*, vol. v. p. 55. and *Gaubius* in the works of the *Harlem Society*, vol. iv.

Before quitting the subject of the gout, we must remark, that in many writers on the materia medica, reports are to be found of benefit received from bitters in cases of stone and gravel. I have never tried them with that view; but from the affinity that subsists between the gout and stone, I can readily believe, that the bitters that are found for some time to prevent the paroxysms of the gout, may also prevent paroxysms of the stone.

After having thus considered the general virtues of bitters, I am to offer some general remarks with respect to their administration and pharmaceutic treatment.

The medicinal part of bitters of every kind may be extracted by either watery or spiritous menstrua, and such extractions

may have the virtues of the substance from which they have been taken: but I maintain, that hardly in any case they ever have it in the same degree; and that, wherever it can be admitted, the bitter in substance is the most effectual, and in some cases, the only effectual mode of exhibiting it. This every body knows to be the case with the Peruvian bark; and I have found the same to be the case in all my attempts to substitute other bitters in place of that bark.

There are cases, indeed, in which the stomach will not bear either the bark or bitters in substance; and therefore it becomes often necessary to obtain their virtues in a liquid form; in the management of which, however, several particulars demand attention.

By infusion in water, and even in cold water, bitters give out their virtues; but to cold water they never give a strong impregnation, though it be generally the most agreeable to the palate and stomach. Warm water, though under the boiling heat, extracts more powerfully than cold, and the more as its temperature is warmer. With respect to every temperature, this is especially to be attended to, that by infusion, bitters suffer a gradual decomposition; and consequently the matter extracted is different according to the length of time that the menstruum has been applied; so that the temperature being given, what is extracted in the first hours is a lighter and more agreeable matter than what is extracted after many hours infusion.

This we have tried with several bitters, infusing the same quantities of the bitter in the same quantity of water, and setting all of them in the same degree of heat for six, for twelve, for twenty-four, and for forty-eight hours. In every experiment, it appeared that the impregnation was stronger according to the length of time employed in infusion, and at the same time that the harshness of the taste was sensibly increased. This, however, was remarked, that the difference of the impregnation was not so remarkable in the longer infusions as in the shorter: and therefore the impregnation did not appear in the forty-eight hours so much in proportion stronger than that of twenty-four hours, or so great as that of twenty-four compared with that of six. On the other hand it appeared that the harshness of taste increased according as the infusion was longer; and therefore the harshness of taste was not so much increased from the twenty-four hours above that of six as it was in the forty-eight hours infusion above that of twenty-four. From all this we conclude, that an infusion of twenty-four hours is sufficient for impregnation, and that little harshness will be produced by infusions of a shorter time; and therefore a sufficiently useful, and the most agreeable, infusion of bitters in cold water, or even of warm water under the boiling heat, will be that of twenty-four hours, or perhaps less. The London college, in limiting their infusions even of boiling water to a single hour, seem to be more nice than is necessary.

The treatment of bitters by cold infusion in wine, is with re-

spect to extraction, much on the same footing with the treatment by water. It does not appear that wine extracts the medicinal qualities more powerfully than water, or in any instance gives a more efficacious medicine, excepting where the wine concurs in the intention of it as a medicine. It is, therefore, almost only for the purpose of a more agreeable medicine that bitters are infused in wine.

A still more powerful extraction is made of bitters by a boiling heat; and here also the same difference arises from the length of time employed in decoction. With respect to bitters it is certain that decoction extracts more powerfully than infusions: but by dissipating any aromatic parts that were joined with the bitter, and by extracting more of the earthy part, and what may be called a coarser bitter, decoctions are always more disagreeable than infusions; and therefore what we call extracts, which are always prepared by decoction, are always less agreeable to the stomach than the bitter in substance. It appears to me that decoction decomposes the substance of what is extracted; for it is seldom that decoctions do not upon cooling deposit a part of what they had suspended before, and that also a matter different from the entire substance. What is exactly the nature of the matter impregnating decoction, has not been duly examined; but we say no more of that here, as it is pretty certain that bitters are never treated by decoction, so as to be either agreeable or very useful medicines.

Besides the ordinary treatment by infusion or decoction, bitters may be treated by the application of water in two other ways. One is, by what I call a Trituration, in the manner of the *Comte de la Garaye*. In this practice, the substance is broken down into very minute parts; but so far as I can perceive, without any decomposition or division of its constituent parts.

The only separation which seems to be made is that of the more soluble from those of a firmer texture; and so far as these more soluble parts possess the medicinal qualities of the subject, they are obtained very entirely, and that in a state more than any other agreeable to the human stomach. They seem to be much in the same state as they are obtained by an infusion in cold water; which by a proper evaporation affords the same sort of matter that is obtained by the *Comte de la Garaye's* apparatus. In either way, we may obtain an efficacious and agreeable medicine; but it is to be doubted if the expence incurred in the preparation will ever allow it to come into much use.

The other management of the application of water, different from the common, is that by the use of a digester. Decoctions are commonly made in open vessels, or in vessels not so accurately closed as to prevent the dissipation of volatile parts; but this can be obviated by the use of a digester: and though in the glass digester we employ, the heat applied can be conveniently no more than that of boiling water; yet we find the medicinal sub-

stances can be abstracted by the apparatus as powerfully as the decoction, and with this advantage, that the volatile parts which either were a part of the substance that is to be extracted, or were added to it for the purpose of rendering it a more agreeable or more effectual medicine.

Bitters are universally extracted by spirit of wine and even by a proof-spirit, not so largely indeed for the most part as by water; but in most instances their medicinal parts are extracted more purely: and the tinctures, when they can be employed in tolerable quantity, seem to be more efficacious medicines than any infusions or decoctions in water.

With respect to the tincture made with a proof-spirit, the same things are to be observed as of those made with water, that there is a gradual decomposition of the substance; and therefore that the tinctures made by a short infusion are more agreeable than those that have stood longer. It should have been observed before, that a spiritous menstruum extracts those bitters that have any aromatic joined with them, more entirely and effectually than is done by water: but in obtaining the spiritous extract, if this be done by drawing off the spirit by distillation, this advantage is commonly entirely lost.

With respect to both the extractions by water and by spirit, this is to be remarked, that the most agreeable bitter is to be obtained by a short infusion: and a stronger impregnation of the same agreeable bitter is only to be got by a repeated cohobation of the same menstruum upon fresh parcels of the same material.

This further is to be remarked, that watery infusions, if made tolerably strong, prove very disagreeable; and the employment of the tinctures with rectified spirit will always be limited by the menstruum; and therefore the tinctures made with proof-spirit will always give the most convenient extraction: and I have found that the employing a digester for brandy tinctures makes a more powerful extraction than can be got by long infusion, and that with very little trouble.

Having now said what relates to bitters in general, we proceed to examine how far the general virtues prevail in the particulars of our list, or under what peculiar modifications they are to be found.

PARTICULAR BITTERS.

GENTIAN.

I BEGIN with this root because I find it to be a most simple and pure bitter, more perfectly free from any of that aromatic or astringent quality which is so frequently conjoined with others: at the same time it is a pretty strong bitter, and has every virtue that has been ascribed to bitters in general, which we have detailed above.

It has been at all times, and still is, much employed in medi-

cine: and with respect to its pharmaceutic treatment and administration, every thing that we have said above with respect to bitters in general is applicable to this. There is some variety in the formulæ; but the differences are of no importance. *Dr. Whyte's* tincture has been justly commended: but the virtues of it depend more upon the Peruvian bark than upon the gentian.

The febrifuge virtues of gentian have by some writers been made equal to those of the Peruvian bark: but in many cases the gentian alone has fallen short of that. But joined with galls or tormentil in equal parts, and given in sufficient quantity, it has not failed in any intermittents of this country in which I have tried it.

A medicine has been long famous and much employed in this country under the title of *Stoughton's Elixir*.—The present elixir stomachicum, or tinctura amara of the last editions of the Edinburgh dispensatory, resembles it very exactly, and I am certain has all the virtues of it. This, however, as *Dr. Shaw* has advised, may be further improved, by pouring the tincture upon a fresh parcel of the materials in half the quantity of those first employed.

There has been some question about the species of gentian most fit to be employed. The gentiana lutea is chosen by the British dispensatory; but if in Germany they employ the gentiana rubra, it will make very little difference. In Norway they employ the gentiana purpurea, and perhaps with advantage. For some time past we have had the root of this species imported into this country under the title of *Cursuta*, so named from the Norwegian name of it *Skarsote*. Some persons have thought it a stronger bitter than the common gentian, or root of the gentiana lutea; but I know of no experiments made for proving this; and it appears to me in its sensible qualities to be very much the same with the common gentian.

CENTAURIUM MINUS.

As this is a species of gentian, it has the virtues of the genus, and has been commended for all the same qualities as gentian or other bitters. The centaury, therefore, is not very scientifically introduced, as commonly done, into the same compositions with the gentians. Professor *Murray* properly observes, that as an indigenous plant it may be properly preferred to a foreign drug: but I find it inconvenient to employ the centaury: as in an equal weight it takes up more of the menstruum than the root of the gentian: and if it is to be taken out by expression, it spoils the elegance of the infusion or tincture. *Dr. Lewis* has justly observed, that the petals are insipid, or at least have very little bitterness: and it is therefore improperly that the summities are commonly prescribed. It is said that the extract of this plant is less agreeable than that of gentian: but I find no difference between them, and think it should be constantly substituted for that of gentian, as it may be more cheaply prepared.

QUASSIA.

We can find nothing in this wood but a pure and simple bitter. In several specimens I have found the bitterness to be pretty strong: but for the most part it is, to my taste, not more bitter than the columbo, or even than good gentian. We are obliged to Professor *Murray* for his compilation on the subject of quasia; but after all that has been said by him and *Mr. Ebeling*, we find hardly any virtues ascribed to quassia which have not been to other bitters.—Upon the whole, I believe quassia to be an excellent bitter, and that it will do all that any pure and simple bitter can do: but our experience of it in this country does not lead us to think it will do more. And the extraordinary commendations given of it are to be ascribed to the partiality so often shown to new medicines, and especially by those who first introduce them, and by those who have a connection with the country from whence they are brought.

SIMARUBA.

I insert this here, partly because it is a species of the same genus with the preceding article, and partly, but especially, because it seems to be very nearly of the same qualities; for we can perceive nothing in it but that of a pure and simple bitter.

The virtues ascribed to it in dysentery have not been confirmed by my experience or that of the practitioners of this country: and leaving what others are said to have experienced to be further examined and considered by practitioners, I can only at present say, that my account of the effect of bitters in the dysentery, will perhaps explain the virtues ascribed to the simaruba. In dysentery, I have found an infusion of camomile flowers a more useful remedy.

MENYANTHES.

This is a strong bitter, without discovering either by taste or smell any peculiar acrimony combined with it. Its juice strikes a black colour with the solution of green vitriol, which implies some astringency; but the same is not discovered by the taste or any of its effects. We consider it as a very pure bitter; and as it is of a strong kind, we suppose it to have all the virtues that have been ascribed to any other bitters; though upon account of its strong taste it is less agreeable than some others.

Dr. Alston's observation on this plant deserves to be remarked: "I knew it (says he) to have very remarkable effects in the gout, in keeping off the paroxysms, though not to the patient's advantage." This is to be collated with, and added to, what we have said on the use of bitters in curing the gout.

This plant has been said to lose its strength by drying; but that seems to be a mistake, for I have often, and most commonly, used it in its dry state with all the advantages I could expect.

I have had several instances of its good effects in some cutaneous diseases, of the herpetic or seemingly cancerous kind. It was taken by infusion in the manner of tea.

CARDUUS BENEDICTUS.

This is a simple and very pure bitter, but not a very strong one; and has therefore none of the extraordinary virtues that have been ascribed to it. It is said to be extracted most agreeably by an infusion in cold water; but I find that boiling water, if not applied above twenty-four hours, makes it hardly less agreeable, and is much stronger than the former.

LUPULUS.

This is a pure and simple bitter, though not without something odorous and aromatic in the flowers, which are the parts employed. Their use in preparing malt liquors is well known. The same effect of preserving these liquors for a long time without acescency may be obtained by other bitters; but none of them are so agreeable as the hop. This might also be agreeably employed in medicine; but we have no particular experience of its use.

FABA STI IGNATII.

This is the most intense bitter we are acquainted with, and in a very small dose it has the effect of curing intermittent fevers. Whether it operates as a pure bitter, or as having combined with it a narcotic power, I will not determine; but we have mentioned this in another place as an example of such a combination, and as a ground for suspicion that all the bitters have more or less of a narcotic quality. However this may be, our present subject belongs to a genus of poisonous plants, and is therefore hardly to be employed where any safer remedies are known.

FUMARIA.

This is not commonly enumerated among the bitters; but it deserves to be so; for this is its only sensible quality: and though it is more disagreeable than many others, it is without acrimony or astringency. It is omitted in the London dispensatory, but retained in ours, and in every other that I know of. I have found it useful in many cases in which bitters are prescribed; but its remarkable virtues are those of clearing the skin of many disorders. For this it has been much commended; and I have myself experienced its good effects in many instances of cutaneous affections, which I would call *Lepra*. I have commonly used it by expressing the juice, and giving that to two ounces twice a day; but I find the virtues remain in the dried plant, so that they may be extracted by infusion or decoction in water; and the foreign dispensatories have prepared an extract of it, to which they ascribe all the virtues of the fresh plant.

It has been frequently observed with respect to this extract, that after being kept for some time it shows a crystalization upon its surface, which is a saline matter of the nitrous kind, and this in much larger proportion than in any of the other bitter extracts. Whether this contributes to its peculiar virtues, I leave it to the learned to determine.

COLUMBO.

This is a root that we have become acquainted with within these forty years: and since the account given of it by the learned *Dr. Percival*, it has come to be frequently employed in practice. When first brought into Holland, it was introduced as a remedy in dysentery; and both in Holland and in Germany it was employed in that disease with much commendation. *Dr. Percival* informs us that he had sometimes found it useful in dysentery: but he does not speak of it as of much importance in that disease: and so far as I can learn, the employment of it in that way has not prevailed in Britain.

I find this root to be a strong and agreeable bitter, and have employed it in many instances of dyspepsia with great advantage. In stopping vomiting it has frequently answered; but in many it has failed entirely, and even in cases where there seemed to be a redundancy of bile. With respect to its peculiar power of changing the acrimony, or correcting the putrescency of the bile, which *Dr. Percival* ascribes to it, neither the experiments of *Ebeling* in his dissertation on the quassia, nor some that I have made, show it to be more powerful than other bitters; and therefore do not allow me to think it has any specific power in that respect.

CHAMÆMELUM.

Under this title we have two plants whose flowers are employed as marked in our list; and there is some question, which ought to be preferred. The virtues are precisely of the same kind; but I have always judged the Roman or double-flowering camomile to be the strongest: and if any regard is to be had to the essential oil, this certainly affords the greatest quantity; and I am informed, that in warmer climates where it is a native, the qualities of it are much stronger than with us.

These flowers have been long celebrated as stomachics; and I have found them answer both in powder and in infusion the purposes of any other bitters. Before the introduction of the Peruvian bark, they were much employed in the cure of intermittent fevers; and our celebrated countryman, *Dr. Pitcairn*, was of opinion, that their powers in this respect were equal to those of the Peruvian bark.

Hoffman seems to have thought them a very effectual, and at the same time a safer remedy. I have accordingly employed them: and, agreeable to the method of *Hoffman*, by giving, several times during the intermission, from half a drachm to a drachm of the flowers in powder, have cured intermittent fevers. I have found, however, that these flowers were attended with this inconvenience, that, given in a large quantity, they readily run off by stool, defeating thereby the purpose of preventing the return of paroxysms; and I have found, indeed, that without joining with them an opiate or an astringent, I could not commonly employ them.

This quality of the camomile in moving the intestines, renders them often useful in flatulent and spasmodic colic ; and upon the same ground I have found them useful in dysentery, and rather hurtful in diarrhœa.

TANACETUM.

Both the herb and flowers have been employed ; but the herb is the stronger of the two, and may be employed for any of the purposes of bitters, but does not seem to be near so strong a bitter as camomile and several others already mentioned. It had almost gone out of use, till lately it was again brought into practice as a powerful remedy against the gout ; and as such was employed by many persons in this country. I was not living in this city when the cases occurred to *Dr. Clark*, which he mentions in the Physical and Literary essays ; nor have I learned what was the fate of these persons afterwards ; but I have since learned, or have been informed, of many persons of this city, who have drank of Tansey tea, as a remedy for the gout. Of these, however, I have known several who have taken it without any advantage, and some others who reported that they had been relieved from the frequency of their gout : but I know of none who have employed it in such quantity, or for such a length of time, as might lead me to expect those consequences which I have mentioned before as following the use of the Portland powder.

ABSINTHIUM.

This is one of the most famous among the bitter plants, and has been used with much commendation for every purpose of bitters. It is an odorous plant, and gives out in distillation an essential oil, which, however, has not any bitterness ; and therefore cannot be supposed to contribute any thing to the effect of the plant. When indeed it is entirely dissipated in making the extract, this retains all the bitterness of the plant ; and, in my opinion, all the virtues depending upon it. Some physicians make a choice among the species, and prefer the Romanum or Ponticum to the Absinthium vulgare. But the Edinburgh college are of opinion, that there is no foundation for this ; and that the absinthium vulgare, as the most powerful bitter, is always to be preferred. They have erred, however, in prescribing the summitates ; as I truly find the leaves to afford a stronger bitter than the flower and tops. In the tinctura absynthii, the college have given an example of the proper treatment of bitters in order to obtain a lighter and more agreeable bitter, and at the same time a stronger impregnation. I am of opinion, that they should have employed the same management in other cases ; but in the example of wormwood, they have allowed both infusions, especially the second, to be for too long a time. The pharmacopœia Rossica has copied exactly that of Edinburgh ; and has very properly directed the other bitter tinctures of carduus benedictus, and centaury, to be made upon the same plan of dou-

ble infusion. In the pharmacopœia Danica, the *esentia absynthii* is too much and injudiciously compounded.—Neither the pharmacopœia Danica, in adding the zedoary, nor the Swedish, in adding the galanga, to their bitter tinctures, have in my opinion judged very properly. With respect to the absynthium, there is a question, whether it is imbued with any narcotic power? *Lindens Stolpe*, and his commentator *Stenzelius*, have asserted it very strongly; but there seems to have been a peculiar idiosyncrasy in the instances they mention; and we should not mind their account, if the same opinion of its narcotic power had not been also delivered by some others.

On the other hand, however, Linnæus informs us, that persons taking wormwood every day for six months together, observed no such narcotic effects. I have not had an opportunity of making proper experiments: but to me, with *Bergius* and *Gleditsch*, the odour of wormwood seems temulentans, that is, giving some confusion of head: and formerly, when it was a fashion with some people in this country to drink *purl*, that is, ale in which wormwood was infused, it was commonly alleged to be more intoxicating than other ales. This effect is improperly supposed to be owing to its volatile parts, for the reasons I have given above; but I am more ready to admit the general doctrine of a narcotic power, as I believe from several considerations, particularly from the history of the Portland powder, that there is in every bitter when largely employed, a power of destroying the sensibility and irritability of the nervous power.

To wormwood, as to every other bitter, has been ascribed an anthelmintic virtue; and this has been supposed to be more considerable in the seed of a certain wormwood than in any other bitter; but of this I have said enough above, when treating of the general qualities of bitters.

ABROTANUM.

This, as a species of the same genus *Artemisia* Linnæi, has certainly the same virtues as the other species of it. It contains, however, less of the bitter, but more of the aromatic; and if it deserves, as Professor *Murray* thinks, to be more employed than it has been, it must be on account of its aromatic and volatile parts; of which, however, the peculiar virtues are not yet well ascertained. These qualities, however, give a probable reason for its being frequently employed, as it commonly is, in fomentations.

There were formerly two herbs under the title of Abrotanum in our dispensatory lists, under the improper distinction of *Mas* et *Fœmina*, but the latter of a different genus, and in every respect of inferior virtue, which is now omitted in the British dispensaries, and indeed in most others.

SCORDIUM.

This plant has a bitter joined with some volatile parts; but neither of these qualities are considerable enough to retain it in

the present practice. It was formerly much celebrated as an alexipharmic; but we do not allow this to be a term of any clear and determined meaning: and in most instances think it has been an imaginary power, that is not supported by any clear or well ascertained experience.

There are two other species of the teucrium, the Chamædrys and Chamæpitys, which have formerly had a place in our dispensatory lists; but they are now omitted in that of Edinburgh: and though they still hold a place in that of London and many other dispensatories, I do not expect to see them brought again into practice, as their qualities, whether as bitter or aromatic, are by no means considerable. They have been celebrated for antarthritic virtues, and make a part of the Portland powder; but they are manifestly not the most powerful or valuable part of that composition. When employed by themselves, as they have sometimes been, I would make the same remarks with respect to them as I have made with respect to the Portland powder, or other medicines that have been proposed for the cure of the gout.

ARISTOLOCHIA.

Which of the species of this genus are to be preferred, I cannot determine; and believe the difference between the rotunda, longa, and tenuis, is not considerable; though the latter seems now to be preferred by both the colleges of London and Edinburgh. They are all of them considerably bitter, with more acrimony than in any other of the bitters commonly employed. Its name seems to have arisen from the supposition of its emmenagogue virtues: and in some cases of retention and chlorosis, as a warm and stimulating medicine, I have found it useful; but in cases of suppression I never found it of any use: and the commendation of it by the ancients, in promoting the lochia, facilitating birth, and promoting the exclusion of the secundines, is very ill founded, and affords a remarkable example of their imperfect knowledge; and an example which, if followed, would lead to a mischievous practice.

The aristolochia has been long commended as a cure for the gout. It makes a considerable part of the Portland powder; and has often been employed by itself in the same manner as that powder, to be taken every day for a great length of time. It has the same power of preventing fits of the gout, and commonly with the same consequences; of which many instances are recorded by the physicians of Germany. To this purpose I would make only one quotation from the late learned and experienced *Werthoff*, first physician to his late Majesty for the electorate of Hanover. The quotation is taken from his *Cautiones Medicæ*, page 346 of his works, published by *Wichman*. After speaking of the power of diet in the cure of the gout, he has the following words:—"Si diæta minus sufficiat, in declinatione, sed lenta longaque nimis, ad maturandam firmandamque integritatem, et ad præcavendam reversionem nimis subitam, veterum illæ anti-

doti amaræ tonicæ, apud Sennertum, Schneiderum *de Catarrhis, Waltherum* in Sylva Medica, collectæ, quas inter præcipue aristolochiæ species, rotunda, cava, longa, et clematidis, memorari merentur, experientiam moderatarum laudum testem reperiunt. *Brunner* de pancr. secund. p. 143. eleganter, ut solet, et distincte, ‘tincturæ,’ inquit, ‘illius antipodagricæ ex rad. aristol. longæ, aut pilularum, aut pulverum amaricantium usu per annum continuato, paroxysmi podagrici in nonnullis mitigantur, in aliis penitus extinguuntur. Nimirum longo amaricantium usu, acore stomachi emendato, refracto, et attemperato, fructus exinde propullulantes sponte cadunt sua. Sed et nimio amaricantium horum usu fermentum stomachi adeo debilitatem esse memini, ut nonnulli appetitum amiserint, cibos non concoxerint, mortem hinc potius, quam sanitatem, accelerarint, malique et infausti remedii, sævas dederint penas.’ Nempe spiritus vini, sulfure amaricante saturatus, qui opio haud valde absimilis est (de cuius abusu pariter noxio, v. idem *Brunnerus* ibidem, p. 80. seq.) et inflammans insuper, et impense exsiccans, haud satis tutus ita continuato usu videtur. Neque ideo illam ex vini spiritu potulentam tincturam sive infusionem, usurpare pro eo scopo ausim; quum, licet corrigat, et adversus paroxysmos roboret ipsum remedium amarum, ignea vicissim et elastica spiritus vini indoles materiei augendæ, perturbandæ, et visceribus incendendis apta est; cæteroqui etiam vino ipso magis incongruens. V. quæ de noxa infusionis ejusmodi ex aristolochia longa habent *Ephem. Curios. Noviss. A. 3. p. 62. seq.* Ipsa vero pulverum amarorum cumulata assumptio, quamvis moderatiori, pro *ευφορία* et indicatione, usu tuta, stomachum tandem abusu gravat, tonumque et digestionem arte nimis diu roborare affectando, naturam tandem suam rite agere vel prohibet, vel desuescere facit; vel etiam, incenso ultra digestionis vim appetitu, diætæ erroribus accitis, in coctionis negotio fatisce patitur. Atque haud scio an, perpetuo et nutricao quasi amaræ medicinæ usu, quæ in alimentum corpori nata haud videtur, alienior tandem ipsis succis nostris crasis imprimi possit: licet id non fiat, si medice utaris, et obtento scopo omittas.”

Although it may not be easy either to explain or vindicate all the reasonings in this long quotation, yet it would have been improper to abridge it, or to refer merely to *Werlhoff's* works, which I could not suppose to be in the hands of many of my readers; and I am at the same time persuaded, that any person who has the least disposition to enter into the question concerning the use of bitters in the gout, will find, in the above quotation, some illustration and confirmation of what I had before delivered on the subject.

SERPENTARIA VIRGINIANA.

This, as a species of aristolochia, is placed here; and it has very much the qualities of the genus: but by certain accidents, this and the other species of aristolochia have been considered as very different. The serpentaria, both in taste and flavour, is

more agreeable than the other species : and it is by its sensible qualities of bitterness and aromatic acrimony that we can account for the virtues justly ascribed to it.

Both these qualities render it antiseptic, and powerfully tonic ; and therefore suited to prevent gangrene. The same qualities will account for its cure of intermittent fevers, especially when combined with Peruvian bark and astringents.

By its aromatic acrimony it proves a powerful stimulant to the system ; and therefore may be useful also in some cases of continued fevers : but as the cure of either intermittent or continued fevers by stimulants alone, is an ambiguous and dangerous practice, so in the former it is only safe when joined with the bark ; and the use of it in continued fevers is to be employed with much caution. The common opinion of its alexipharmic powers, both with respect to it and all the others which have gone under the same title, is an incorrect and false notion, liable to much abuse, and which I myself have had occasion to observe. The stimulant power of the serpentaria is especially suited to the low and advanced state of the typhus only ; and even then it will be more safely joined with the bark than employed for its stimulant power alone. It is certainly owing to this ambiguity in its use, that it is not nearly so much employed in practice as it was some forty years ago.

CORTEX AURANTII.

This by an oversight was omitted in our catalogue ; but must be taken notice of here.

Aurantium or *Orange*. It is a species of the citrus ; and that with the lemon, being the species chiefly imported, is that which is employed by us in medicine. The fruit affords an agreeable acid to be mentioned hereafter ; but our business here is only with the yellow rind of the fruit. It is properly reckoned among the bitters, and seems to have the virtues common to these ; but with its bitter it contains a considerable portion of volatile aromatic oil, very different from any other that is combined with other bitter, except what is found in the lemon. The combination of this oil with the bitter in the orange-peel, gives it certainly peculiar virtues, that are not, however, clearly ascertained : and it is rarely that this peel is with us employed except in compositions with the other bitters, which prevents us from discerning its peculiar virtues.

Formerly the unripe fruit, before they came to contain any juice, were employed in the shops under the title of *Aurantia Curaslaventia* ; and in that state they contain a stronger bitter than the peel of the grown fruit, though to me they do not show so much of the aromatic as the latter. I doubt much if the Edinburgh college have not done improperly in omitting the *Curaso* apples which formerly stood in their list.

With respect to the virtues of the peel, as at present employed,

it is very probable that both by its bitter and aromatic parts it may be particularly useful in restoring the tone of the stomach, when it has been much impaired; and I have had several observations that justify this opinion. But it does not appear so often as it should, because we employ it almost only in its dried state, and in too small proportion; as we take it dried with a part of the white inert substance that is also in the rind of the orange.

Although I have no particular experience of it, it is probable enough that the orange-peel employed by itself may be useful in curing intermittent fevers. It is not, however, so probable to me, that it has ever been useful in moderating, or restraining uterine hemorrhagies; and upon the authority of others I have employed it, but without success: and as the decoction made according to the prescription by *Dr. Whyte* had still much bitterness, I judge it to be rather hurtful.

Here I might mention the lemon-peel as a bitter; but it has less of that quality than that of the orange; and therefore if it be employed, as it is in the infusion gentianæ compositum of the London college, I take it to be on account of its aromatic rather than its bitter qualities.

Among the bitters I am disposed to mention the leaves of the orange tree, which have of late been much recommended as a cure of epilepsy.

Of these, however, I have had little opportunity of making trials; and the few I have made were without success. The sensible qualities of those leaves are bitter and aromatic: but in both respects weaker than in the orange-peel; and there is nothing in them that would lead me to expect any specific virtue.

ARNICA.

As this plant is not a native of Britain, and we have found some difficulty in procuring it from abroad, I have not been able to make it a subject of my own observation. In this situation I think it safer to refer my readers to writers on the subject, and particularly to *Collins's* dissertation upon it, than to give from them a compilation which must be short, and might be imperfect.

CASCARILLA.

I have been uncertain where to place this substance, whether here with the aromatics, or with the tonics; and I am of opinion that the latter is its proper place. It approaches to the aromatics by its essential oil; but its bitter, to be extracted by either water or spirit, is its most considerable part.

It was introduced into practice in the last century, as a medicine of great value, both in continued and intermittent fevers: and the *Stahl*ians, fond of any thing as a substitute for the Peruvian bark, against which they had declared so strongly, received the cascarrilla, and employed it much in practice, and have given many testimonies of its efficacy. But these testimonies have not been supported by other practitioners since; and particularly in this country we have found it a very weak substitute for the Pe-

ruvian bark. *Bergius* says of it, "Ast fatendum illum in ipsis febribus parum facere, neque tertianis vernalibus certo mederi." Our experience in this country is suitable to this; and in several trials it has entirely failed. What *Bergius* adds to the passage quoted, "Sed in hemoptysi sæpe prodest," is not supported by our experience. And in hemorrhagies of all kinds, it seems to be rather hurtful, as might be expected from its aromatic and bitter qualities, while it does not in any instance discover an astringent power. It may be allowed to be of tonic and stomachic power; but even in this way its virtues are not peculiar nor considerable: and there is no just foundation for the prejudices which the German physicians have conceived in its favour.

CORTEX PERUVIANUS.

This is one of the most considerable articles of the *materia medica*: and as the most frequently employed, so it has been very frequently the subject of writing and of much discussion. There is some general agreement amongst the practitioners with respect to many of its virtues. But the agreement is not universal: and many disputes still subsist with respect to the circumstances and manner in which it is to be administered.

Upon many of these points it is incumbent on me here to offer my opinion; which I shall accordingly do upon the principles I have already laid down, and as it appears to me to be confirmed by an attentive and often repeated experience. I have an aversion to controversy: and shall not therefore enter into any; more especially with many of the frivolous writers who are to be met with upon this subject.

As the foundation of the whole of my doctrine, I consider the Peruvian bark, which, like other writers, I shall commonly speak of under the simple title of the bark, to be a substance in which the qualities of bitter and astringent are conjoined. These are sufficiently obvious, and seem to be universally allowed. It may also have somewhat of an aromatic quality; but this certainly is not considerable, and I shall not take any further notice of it.

As a bitter and astringent conjoined, I consider the bark as a powerful tonic. As we have before shown that these qualities in their separate state give tonic medicines, so it will be readily allowed, that, conjoined together, they may give one still more powerful; and as such we are now to consider the bark in its effects and virtues, according as these appear in the various cases of disease.

The first to be taken notice of is, its operation on the stomach. In many cases dyspeptic symptoms manifestly arise from a loss of tone in the muscular fibres of the stomach; and in such cases as other bitters are, so the bark is a remedy, and one of the most powerful. No body doubts of its being a tonic with regard to the stomach; and it is equally well known that the state of the stomach is readily communicated to the rest of the system. It

is in no instance, however, more remarkable than in the cure of intermittent fevers.—That the bark in this case operates by a tonic power exerted in the stomach, I have endeavoured to explain in my *First Lines of the Practice of Physic*; and have met with nothing in any writing to make me doubt of the truth of my doctrine. It may, indeed, have its imperfections, and may not sufficiently explain the whole of that variety of phenomena which may occur in such a diversified and complicated system as that of the human body; but in attempting any general doctrine, we must begin with attempting it as adapted to the most general and ordinary course of things. This I hope is done in my doctrine respecting fevers, and of the operation of the bark in the cure of intermittents: nor shall I think it shaken by its not obviously explaining those irregularities that may happen in the course of fevers, and in the use of the bark; and especially those pointed out by the indigested views of some practitioners, little aware of the many fallacies to which almost every observation upon these subjects is exposed.

We proceed, therefore, upon the supposition that the bark possesses a tonic power, and that the action of this power in the stomach sufficiently explains its operation in preventing the recurrence of the paroxysms of intermittent fevers; for I see no foundation for referring it to any mysterious and unexplained specific power; which, however, some writers seem still disposed to maintain. I hold it to be established as a fact, that both astringents and bitters, in their simple and separate state, have proved often sufficient to prevent the recurrence of the paroxysms of intermittent fevers: and that they more certainly do it when combined together. Both these facts I have not only from the testimony of the most credible authors, but from particular experiments made by myself for the purpose of ascertaining them: and tho' I should admit what is frequently alleged on this subject, that such remedies are frequently insufficient, I consider it as a frivolous argument; as a different degree of power does not affect the general question concerning the nature of that power. Nobody certainly will maintain, that pale bark is not capable of curing agues, because it is not so powerful as red bark.

Having thus established the nature and operation of this medicine, we proceed to consider the various questions that have arisen with respect to the use of it in intermittent fevers. It would now be superfluous to consider the objections which were formerly made to its use in general. Although these objections had for a long time some weight with some of the most eminent practitioners, it is presumed that every doubt and difficulty of that kind is now removed; and whilst it is allowed to be a very safe and very powerful remedy, the only questions which remain respecting it are, In what circumstances it may be most properly employed?

The first question that occurs is, At what time, in the course

of the disease, it may be most safely given? *Dr. Boerhaave's* rule for exhibiting the bark was, "Cum morbus jam aliquo tempore duravit;" and his commentator is at great pains to inculcate the propriety of this general rule. In this, indeed, both of them follow *Dr. Sydenham*; but both *Sydenham* and *Van Swieten* allow there may be exceptions to the general rule: as when an intermittent affects persons under great debility, or when, for example, the paroxysms are attended with symptoms of a dangerous kind: and in such cases every practitioner will certainly take the first opportunity he can find of exhibiting the bark.

This, however, does not touch the general question with respect to intermittents, in which there is no prevailing debility, and where the paroxysms are not attended with any dangerous or even unusual symptoms. In such cases the question still remains, whether the bark may be exhibited without waiting for any repetition of paroxysms? And I am persuaded that, for the most part it may. *Dr. Sydenham's* consideration of the fermentationis nisu desputanti, seems to be absolutely without foundation: and I cannot either perceive that there is any morbid matter to be evacuated during the paroxysms, or that the bark can do any harm by suppressing any natural excretions, as the *Stahlians* have commonly supposed. It therefore appears to me, that the bark may be exhibited very early in the course of the disease.—This general question, however, always involves another; which is, Whether the bark may be exhibited without a certain preparation of the body, that may fit it to receive the bark with greater safety? With respect to this, as we confidently suppose that the bark given in moderate quantity is not ready to disturb the natural functions of the animal œconomy; so, if these be all in a sound condition, we cannot perceive that any preparation of the body is necessary for the reception of this medicine: It shall only be observed, that to render the stomach more fit to receive the quantity of bark which may be necessary, it may be proper, by a gentle vomit, to free it from accidental indigestion, and to excite its activity before the bark is thrown in.

In another case also, when, from the circumstances of the season, and from certain appearances, there is reason to suspect any redundancy of bile, it may be proper to evacuate this by a gentle purgative. This is the explanation to be given of the common opinion of the necessity of clearing the first passages before exhibiting the bark; but I must beg leave to maintain, that such preparation is not always necessary; and that wherever the state of the disease urges an immediate exhibition of the bark, it may be often dangerous to lose time upon the supposed necessity of previously clearing the first passages; or at least, when this is done, it will always be allowable, and even proper, without waiting for the repetition of paroxysms, to put an end to the course of the disease by the use of the bark.

Although, when there is no debility in the patient, nor dan-

gerous symptoms attending the paroxysms, the exhibition of the bark, in complaisance to popular opinion or medical prejudice, may be sometimes delayed; yet if the paroxysms seem to be anticipating their periods, and more especially if they are increasing in their duration, it will be always advisable to stop the course of them by an immediate exhibition of the bark.

There may still, however, be some exceptions to this general doctrine; not only when there are marks of internal inflammation present, but even when there are marks of a general inflammatory diathesis in the system. This I believe to be always aggravated by the tonic power of the bark; and in such cases, accordingly, the bark may not only be hurtful, but as I know from experience, will be ineffectual; till, by blood-letting and other antiphlogistic measures, the inflammatory diathesis is removed or much abated. This is the explanation of the 762d Aph. of *Boerhaave*: “Hinc et venæsectio nocet per se semper prodest alias casu, ut et tenuis exactaque diæta.” It is especially in the case of vernal intermittents that a phlogistic diathesis occurs; and therefore that upon this and other considerations, the exhibition of the bark in these may be most safely delayed; but still it must be allowed that, even in these, it may often be exhibited very early.

There is another consideration which practical writers have mentioned as a reason for avoiding the exhibition of the bark; and that is, when there are marks *obstructi admodum hujus illiusve visceris*.—That there may not be cases of this kind to forbid the exhibition of the bark, I have not sufficient experience to determine; but I am well persuaded that it would be very dangerous to admit of any general rule on this subject. I am convinced that it is in the cold stage of fevers that accumulations of blood are formed in the liver and spleen; that such accumulations are increased by every repetition of a cold stage, and consequently by the repetition of paroxysms; and I am therefore clearly of opinion, that even considerable obstructions of the viscera, if without inflammation, ought not to prevent the exhibition of the bark in such quantity as may prevent the return of paroxysms.

I am more fully of this opinion, because I cannot perceive in what manner the bark can aggravate the obstruction. Its action as an astringent is very inconsiderable, and is fully balanced by its bitterness, which most physicians suppose to have a resolvent and aperient power. The question has several times occurred to me, in the case of persons who, having frequently laboured under intermittents, had tumours and indurations remaining in the hypochondria, and had, when in that condition, a return of the intermittent fever. In such cases I have freely employed the bark, and never found it increase the affection of the liver or spleen: and in other such cases I have constantly found, that the avoiding the bark, and admitting therefore the repetition of paroxysms, brought on disorders which frequently proved fatal.

When, from these considerations, it is determined to exhibit the bark, the next question that occurs is, taking the period as consisting of the intermission and paroxysm, at what time of such period the bark is most proper to be given? With respect to this, I believe, that when the use of the bark was first introduced, the practice was to give a large dose of it a little before the time of an expected accession: and the efficacy of this practice has given occasion to many to imagine, that the bark employed by these first practitioners was of a superior quality to that commonly employed since. We cannot, however, find otherwise any proof of this superiority of the bark then employed; and it is certain that the same pale bark which has been commonly since employed, if given in the same quantity, and at the same time of the period, has shewn very often the same effects. Some eminent practitioners have since opposed this practice; but we are persuaded it has been rather from theory than from observation that they have done so.

Although I would not rigorously insist on the employment of a single dose near to the time of accession; yet I am strongly of opinion, that the nearer the exhibition is brought to that time, it will be the more certainly effectual. To explain this, not commonly understood, we must remark, that the effects of the bark on the human body are not very durable. I have had opportunities of observing, that a considerable quantity of bark given, was not sufficient to prevent a relapse in a few days after. I have likewise found, that in quartan fevers, a large quantity of bark given on the first day of intermission was not so effectual in preventing the returns of the disease, as a smaller quantity given on the second day. In tertians, supposing a certain quantity necessary to be given to prevent the return of a paroxysm, we have found that, by following the practice of *Sydenham*, in abstaining from the exhibition of the bark for some hours immediately preceding accession, though large quantities had been given before, would often fail in preventing it; while, on the other hand, a smaller quantity, given nearer to that time, would more certainly answer the purpose. In many cases, where the accession happened in the morning, I have found that a large quantity given the day before, if not continued during the night, would often fail; when a smaller quantity given during the night, and in the morning, would more certainly succeed. And whenever I met with tertians which had their accessions at noon or after it, I have thought it unnecessary to trouble my patients during the time of intermission on the day before, always finding that a smaller quantity given in the morning or forenoon after, by being thus brought nearer to the time of accession, was more effectual. From all these observations I am satisfied, that the giving a large dose of the bark immediately before the time of accession is the most proper practice: but as that dose must not be under two drachms of pale bark, so there are some stomachs which

will not bear even that quantity, or a larger that might be necessary. It is commonly, therefore, convenient to give smaller doses, but to give them every hour for some hours near to the times of accession.

I have not had much occasion to practise upon intermittent fevers since the use of the red bark became common; but being well persuaded of the superior powers of this species or variety of bark, I think the use of it will particularly favour the practice we have recommended, of giving a due quantity of bark as near as possible to the time of accession.

Having thus said all that seems necessary with respect to the use of the bark in *intermittent*, we proceed to say that it is equally useful and necessary in *remittent fevers*. These have been considered by the Nosologists as of a different order from the intermittents; but, as I judge, very improperly. They arise from the same cause; that is, from marsh effluvia; they prevail at the same seasons; and it is common for the intermittent and remittent fevers to pass mutually into the form of one another. They show therefore the strictest affinity, and found a strong presumption, sufficiently confirmed by experience, that they may be cured by the same remedy.

The only difficulty in admitting this was, the opinion which prevailed very early with respect to the use of the bark; that it was not to be given during the time of paroxysms, and therefore not in those fevers which had no intermission. I believe that this opinion was in the main well founded and proper, with respect to the paroxysms of genuine intermittents: but no other remedy having been found for remittents, the consideration of the analogy induced practitioners to employ the bark in these also. And in spite of prejudices, *Morton* and *Torti* established the practice; and there is now no longer any doubt of its propriety. We have only to add, that though I would not rigidly assert that the bark can never be safely given during the exacerbation or hot stage of fevers, yet I maintain, with the most part of practitioners, that the time of remission is especially to be chosen; and according as that time is known to be longer or shorter, the doses of the bark are to be as large as the patient's stomach will easily bear, so that a due quantity may be thrown in during the time of remission.

Such may be the use of the bark in properly and evidently remittent fevers: but the use of it has been extended also, especially of late, to continued fevers: and there may still be a question, In what species, or in what circumstances of these, it may be properly employed? Which we shall endeavour to answer as well as we are able.

When intermittent fevers have changed into remittents, and these have become of a very continued form, or when either this transition has been manifestly perceived, or that, from the place of the patient's habitation, from the season of the year, and from the nature of the prevailing epidemic, there is reason

to conclude that the fever has arisen from the same marsh effluvia which produce intermittent or remittent fevers in their ordinary form ; in such case, fevers, however continued in their form they may then seem to be, may still be considered as of the intermittent kind, and be treated by the bark, in the same manner that we have shown may be done in remittent fevers of little distinct remission. There are, however, truly very few continued fevers of this kind which do not, being carefully observed, discover some remissions, and therefore give no proper occasion to a question about the use of the bark, arising from their continued form.—Such a question, however, occurs with respect to continued fevers of another kind. There is a fever commonly occasioned by the application of cold, but perhaps also from other causes, to which we have given the name of Synocha, and which, from its symptoms, we judge to be always attended with a considerable degree of phlogistic diathesis. In such fevers, agreeably to our opinion of the tonic power of the bark, we maintain that it cannot be properly or safely employed. And farther, as the same kind of fever attends all genuine phlegmasiæ, that is, pyrexia joined with topical inflammation ; so the bark is not admissible in any of those. Some writers, indeed, mention its salutary effects in various cases of pneumonic inflammation, and such perhaps may occur. But I never found the bark safe in any such inflammatory affection, except when this was not the primary disease, and indeed only when it was accidentally combined with an intermittent, putrid, or nervous fever.

That there may be such combinations is well known : and though there may be some degree of phlogistic diathesis present, it may not be in such a degree as to give the principal indications in the cure of the disease : so, in such cases, the bark may be employed as suited to that principal indication.

In one case of an inflammatory disease, the bark has been considered as an ambiguous remedy ; and that is the case of acute rheumatism. As I consider this disease as especially consisting in a phlogistic diathesis, I hold the bark to be absolutely improper ; and have found it manifestly hurtful, especially in its beginning, and in its truly inflammatory state.

But it is possible, that after rheumatism has continued for some time, and especially after the use of antiphlogistic remedies and sweating, the inflammatory state may be abated, and the disease, in consequence, admit of considerable remissions, and become a periodical disease. The bark, in such cases, may prove a proper remedy ; and I have sometimes found it to be so ; but it requires some caution : for in some instances, where even a remission was evident, and appeared particularly by a copious sediment in the morning's urine, I have exhibited the bark with a bad effect, as the exacerbations became more violent, and the

remissions less considerable, insomuch that I was obliged to have again recourse to antiphlogistic remedies and sweating.

In another case of acute rheumatism the bark may prove a remedy; and that is when the rheumatism is combined with, and makes a part of, an intermittent fever, as that and other phlegmasiæ may sometimes be: and here the conduct may be the same as I have already said to be proper in such cases.

I know of no other case of acute rheumatism in which the bark may be employed. But there are certain circumstances of the human body, in which pains of the joints resembling rheumatism may occur, and in which perhaps the bark may be useful. So far, however, as I know such cases, they are without any phlogistic diathesis, and therefore not properly acute rheumatism. I have met with some cases of hysteric women troubled with pains and tumours of the joints, so much resembling rheumatism, that I have thought it necessary to try blood-letting: but tho' the blood was drawn in the manner most proper to show an inflammatory crust, yet no such crust in any degree appeared, and therefore such cases do not exclude the use of the bark.

The question concerning the use of the bark in inflammatory fevers does not give much difficulty. But there is another kind of continued fever, in which the question is much more puzzling. This is the fever arising from a contagion produced by a certain state of human effluvia. It is this that I have named a Typhus; and which always puts on a very continued form. It is very commonly attended with symptoms of putrescency in the fluids; and always, in some part of its course, with symptoms of a general debility in the system. In the former case they are called Putrid, and in the latter case Nervous Fevers.

It is in these that a difficult question arises with respect to the use of the bark; and this, considered as an antiseptic and tonic, would seem to be well adapted to both cases. But in considering the question, this is to be observed, that both the putrid and the nervous fevers may be combined, especially in their commencement, with a phlogistic diathesis in the system. With this state, as I have said already, I hold the bark to be incompatible; and therefore judge it to be always improper in the beginning of that kind of fever which, in my Nosology, I have named a Synochus. I can by no means concur with certain authors, who maintain, that in the fevers we are speaking of, as soon as the primæ viæ have been cleared by an emetic and purgative medicine, we may immediately employ the bark, and trust the cure of the disease entirely to it. I have frequently observed the mischievous consequences of such a practice, from its aggravating the inflammatory state of the system, and determining to local and fatal inflammations of the brains and lungs.

It is perhaps possible, that a typhus of the nervous or putrid kind may be without any, or much of the inflammatory diathesis; and when at the same time the symptoms of debility and pu-

rescency are not only considerable, but also appear early, I would allow that the bark may be employed very soon in the course of the disease. This, however, I take to be a very rare case; and my observations lead me to judge, that in the beginning of all putrid fevers, and by the testimony of authors, even in the plague itself, that more or less of an inflammatory diathesis some times takes place. We find this to subsist commonly for the first week of our epidemic fevers; and therefore that it is seldom safe to employ the bark during that period. We commonly find that the symptoms requiring its use do not appear till the second week; and even then, till the symptoms of debility and putrescency appear pretty distinctly, the bark cannot be safely employed. When however, very early, the symptoms of putrescency appear in any degree, it will always be allowable to employ the bark: and tho' no clear symptoms of putrescency appear, it will be equally proper in the second week of nervous fevers, when the symptoms of debility are any wise considerable, and when at the same time the system is very free from any appearances of an inflammatory state. To sum up the matter, we are clearly of opinion, that when fevers can be ascertained to be entirely of the putrid or nervous kind, wine and bark are the remedies to be depended on; and that, if either of these remedies have seemed to fail, it has been commonly owing to the necessary quantities not having been thrown in.

We must not omit this opportunity of observing, that there are two cases of our epidemic fevers in which the bark is either useless or hurtful. The first is, when, after much head-ach, a delirium arises; which is somewhat of the phrenitic kind, increased by taking wine, and is attended with a redness and inflammatory state of the eyes. In such cases, we suspect some inflammation of the brain; and dissections have shown it to be so: and in all such I have found the bark manifestly hurtful. Another case of our fevers is, when in their advanced state, with much delirium, there is much subsultus tendinum, with frequent convulsive twitchings of the limbs. In whatever manner this may be explained, I have found that opium is the proper remedy; and it is commonly necessary to give it in considerable quantity.

After treating of the use of the bark in the more simple fevers, we are now to consider it in the more complicated, and particularly in the exanthematic kind.

With respect to these, they are commonly, and, as we may say, naturally, of an inflammatory nature: but in a manner we cannot explain, a putrid diathesis frequently appears in them. In their genuine inflammatory condition, the bark is not only an unnecessary, but an hurtful substance: but when any putrid diathesis appears, it is absolutely required; and the distinction of these cases is always to be carefully studied.

In the small-pox, from an opinion of the bark being favourable to suppuration, it has been employed even during the eruptive

fever; but I have hardly ever observed a case in which it seemed to be proper. Allowing the bark, in certain circumstances, to be favourable to suppuration, it does not appear clearly that these circumstances ever occur during the eruptive fever. It is possible that the eruptive fever of the small-pox may be of the putrid kind, in which therefore the bark might be allowable; but I have hardly ever been able to ascertain such a case: and upon the supposition of its being the case, I have found the exhibition of the bark to be hurtful. In my opinion, it is only after the eruption, that, by the confluence of the pustules and other circumstances, we can discern the putrid diathesis which requires the bark; and when none of these circumstances are present, as in most cases of a distant small-pox, though these be very numerous, the bark in large quantity is very hurtful.

In the secondary fever, the same distinction is to be observed; and as it is most commonly the consequence of the confluent small-pox, so it is very generally of a putrid kind, admitting of the bark: but there is also a secondary fever sometimes happens after a distinct small-pox, which is of the inflammatory kind, to be treated by blood-letting and other antiphlogistic measures; and in which, therefore, the bark would be hurtful.

The measles are very constantly and considerably of an inflammatory nature; and must therefore require still more caution in the use of the bark. I have never seen this disease in Scotland of the putrid kind; but no doubt there may be such as *Dr. Watson* has described, and in which the bark would certainly be proper.

With respect to Erysipelas, the case is much the same. I have very constantly found it to be more or less of the phlegmonic kind; and in this country have hardly seen it in any degree putrid. In erysipelas I have therefore found the bark generally hurtful: but from the account of authors, it appears to me sometimes of a putrid nature; although, as I judge, especially, perhaps only, when it accompanies other diseases of a putrid kind; and in such cases the bark may be a necessary remedy.

In the Scarlatina, there is generally more difficulty in determining this question. In the species of scarlatina that is properly named Anginosa, and which has been the most frequent with us, there are cases exactly the same with the cynanche maligna, in which the bark is the remedy to be depended upon. But I maintain that there is a scarlatina, and even a scarlatina anginosa, in which the bark is superfluous, and has been often hurtful. How these cases are always to be distinguished, is difficult to say: but an observing and skilful practitioner, by the difference of symptoms, and especially by the nature of the prevailing epidemic, will commonly be able to do it.

We say nothing here of the miliary eruption, considering it to be always a symptomatic affection, to be treated with or without the bark, according to the nature of the primary fever.

Among other diseases complicated with fever, the dysentery is to be taken notice of as a disease in which the propriety of using the bark does not seem to be very clearly ascertained. When this disease is of its proper nature; that is, depending chiefly upon a constriction of the colon, and frequently in its beginning attended with some phlogistic diathesis, the use of the bark appears to me to be absolutely pernicious. I have indeed said above, that even in this state, bitters, by their laxative quality, may frequently be useful. But such a quality in the bark is very uncertain; and therefore the analogy of bitters will hardly imply the use of a bitter that may be in this way of uncertain effect, and may be in danger, by its tonic and inflammatory powers, of proving hurtful. In the beginning of dysentery, we judge the bark to be improper: but in the advanced state, when some symptoms of putrescency appear, or when the disease has changed in some measure into the state of diarrhœa, the bark may possibly be employed with advantage.

In another case of dysentery, which sometimes happens, that is, when it puts on a tertian type, and may be considered as a part of the tertian fevers at the same time epidemically prevailing, the bark may become an absolutely necessary remedy.

There is another disease complicated with fever, in which I find the use of the bark to be somewhat nice and difficult: and that is in catarrhal affections. In these, arising, as they commonly do, from cold, an inflammatory diathesis is, I believe, constantly present; and this seems to reject the use of the bark altogether. But there are two cases in which it may be admitted; the one is, when the catarrhal affection is combined with an intermittent fever. And I have often observed the most frequent and violent fits of coughing to be joined with the paroxysms, and particularly with the cold stage of such paroxysms. In such cases I not only do not avoid the bark, but fly to it with more haste.

There is also another case of catarrhal affection in which the bark is of great service. This is in those habitual and frequently returning catarrhs, which depend upon a weak and imperfect perspiration by the skin, and this again upon a weaker force in the action of the heart and arteries. In these cases I suppose there is a greater determination to, and a greater than usual accumulation of fluids, in the lungs; and that these circumstances and their effects are only to be obviated by invigorating the system of the aorta, for which I hold the bark and riding to be the most effectual means.

Another case of complicated fever on which I would here remark, is that of hæmorrhagy; in which the use of the bark is, in my opinion, very inaccurately ascertained, but may, I think, be determined in this manner. When the hæmorrhagy is of the active kind, that is, accompanied with a phlogistic diathesis, the bark is a pernicious medicine: and I have always found it to be

so. Accordingly, as the hæmoptysis appears to me to be very universally of the active kind, so I have constantly found the bark to be very hurtful in all the species of it that I have ever met with. There are, however, cases of passive hæmorrhagy, a frequent instance of which occurs in the menorrhagia, where the disease depends upon a laxity of the extremities of the uterine vessels, which are therefore readily opened by every irritation applied to the system, or to the diseased part. In such cases, the bark is the most proper, and, when the remote and exciting causes can be avoided, an effectual remedy. Upon this subject two remarks may be made: One is, that though a hæmorrhagy may seem to be excited by irritation, it is not therefore to be immediately concluded to be of the active kind, and therefore forbidding the use of the bark. The other remark is, that the bark, in passive hæmorrhagy, does not act as an astringent, in which way its powers are very inconsiderable, but a tonic, which might be hurtful in any hæmorrhagy of the active kind.

After mentioning catarrh and hæmoptysis, I am, in some measure, necessarily led to say something with respect to the use of the bark in the Phthisis Pulmonalis. This disease is so constantly attended with a phlogistic diathesis, that I am disposed to reject the use of the bark in it altogether. There are, however, practitioners who are of a different opinion: but I can assert, that in nine cases of ten in which I have seen it employed, it proved manifestly hurtful.

There are, however, circumstances of the phthisis we spoke of, in which the bark has been useful. I have met with cases in which, with all the symptoms of phthisis, the exacerbations of the hectic were marked with more or less of a cold stage, and regularly at stated periods, commonly quotidian, but sometimes tertian. In such cases I have given the bark with the effect of preventing the return of such paroxysms for some time, and at the same time with the relief of almost all the other symptoms of the disease. I never, however, in such cases, made a complete cure: for in spite of large exhibitions of the bark, the paroxysms in less than a fortnight or three weeks after they had been stopped, always returned: and tho' they were again and again, by the same means stopped, they returned with greater violence, and proved fatal, with all the ordinary symptoms of phthisis.

As the Phthisis Pulmonalis depends so often upon tubercles of a peculiar nature, which with no probability can be resolved by the bark: so this is another reason for my avoiding the use of it in this disease. But whether there be cases resembling very exactly the phthisis from tubercles, in which however there are none present, and therefore a more curable disease, and perhaps admitting the use of the bark, I cannot positively determine; but am disposed to believe, that there are cases, with all the symptoms of the phthisis pulmonalis, without tubercles, and depending upon a successive formation, and healing again of small vo-

micæ; in which case the bark may possibly be useful. In all the cases of convalescence which happen after a purulent expectoration, I judge the disease to have been of this kind.

To finish my consideration of the use of the bark in febrile diseases, I must next mention the noted cure of gangrene which is frequently, though not always, connected with fever.

The theory of this has been considered as very mysterious, but it seems to me that it may be made very plain. In all the cases in which I have observed the cure of gangrene by the bark, I have found that it was by exciting a degree of inflammation and suppuration around the gangrened part; and that the dead part was by this separated from the living, and thus disposed to be thrown off. This is sometimes, and perhaps might be often, done by an effort of nature; but this is commonly prevented by the loss of tone in the gangrenous spreading into the neighbouring parts. It is this, however, that is prevented, by the bark supporting and invigorating the tone of the neighbouring parts, and producing the inflammation we have mentioned.

This may serve to explain the different operation of bark in different cases of gangrene. Whenever it arises from causes producing a loss of tone, and thereby a gangrene in any part, the bark is likely to be effectual in stopping its progress; but where the gangrene arises from the acuteness and violence of inflammation in the part, there the bark is likely to be not only ineffectual but hurtful. The theory of *Sir John Pringle* may be found to be nearly the same, and might be expressed in the same language with that we have employed. In the 39th page of his Appendix, 4to edition, he has the following words: "Thus the bark will fail in a gangrene, if the vessels are too full, or the blood is too thick: but if the vessels are relaxed, and the blood resolved or disposed to putrefaction, either from a bad habit, or from the absorption of putrid matter, then is the bark specific." The whole of the observations I have had an opportunity of making in cases of gangrene, have fully confirmed this doctrine.

I have now concluded what relates to the use of the bark in febrile disorders; and shall next take notice of its use in some chronic cases. But after what I have said above of tonics in general, and of bitters more particularly, it only remains to say here, that in the cases to which tonics are adapted, the bark, as one of the most powerful, must be especially proper.

There are two diseases seemingly depending on the laxity of the system; and therefore it has been supposed that the bark might be, and it is alleged that it has been, actually useful in the cure of them. These are the diseases of scrophula and rickets. I have no doubt that in both a considerable degree of laxity and flaccidity takes place in the system: but I am very far from thinking that either of the diseases consist alone, or even chiefly, in this circumstance: and if it was proper here, I could render it probable that these diseases depend upon certain peculiar

conditions of the system, which do not arise from, and indeed rather induce, a general laxity of the whole: and I would particularly assert, that what has been said with respect to the affinity between the two diseases appears to me to be an erroneous judgment. But whatever may be in this, I cannot conveniently enter into controversy here; and do not think it necessary, as I must add that in all the instances I have seen, and they are not a few, of the use of the bark in these diseases, I have never seen clearly any benefit derived from it.

It is much more probable that spasmodic diseases, depending upon a weakness of tone in the system, should be often cured by the use of the bark. Accordingly, it has been much employed in many of these, and particularly in cases of epilepsy; but in this I have been often disappointed.—When epilepsy depends upon organic affections of the brain, I believe no remedy is to be found for it; or when this disease is connected with a phlethoric state, and is excited, as it frequently is, by an occasional turgescency of the blood in the vessels of the brain, I think neither the bark nor any other tonic can be properly or safely employed. It is only when epilepsy depends upon a mobility of the system that we can expect the bark to prove a remedy; and in such cases it may have often proved useful: but I have hardly found it to be so; and am of opinion, that the fossil tonics, as chalybeates, cuprum ammoniacum, flowers of zinc, or white vitriol, are always found more effectual.

There is indeed one convulsive disorder in which I have found the bark remarkably useful; and that is the chorea, which I believe to depend upon a state of mobility at a certain period of life. In this disease, I think the preparations of copper and zinc cannot be employed with safety so often, or rather so long, as might be necessary; and therefore, that chalybeates and bark are the safer remedies: and we are of opinion that the latter is more safe than the former.

In another convulsive disorder, the chin-cough, we know the bark to be often an effectual remedy: but there is some difficulty in determining the proper time for its exhibition. Where the disease is yet recent, and the contagion perhaps still acting, it is often hurtful. But when the disease is more advanced, and the force of the contagion is probably gone, and the disease continues by the force of habit only, I am pretty certain that the bark will then soon put an end to it, provided only that no congestion has been formed, or continues in the lungs.

With respect to asthma, my doctrine must be the same as with respect to the epilepsy. When the asthmatic paroxysm depends upon an occasional turgescence of blood in the vessels of the lungs, the bark is an improper, and may be a hurtful medicine; but when the asthma depends upon the mobility of the system, as in the hysteric asthma of *Sir John Floyer*, the bark is an useful remedy; and in some instances I have found it to be so.

There remain to be mentioned some spasmodic affections, in which the bark has been much celebrated. These are commonly named Hysteric, and are of very various form. In those cases in which such paroxysms as I have described in my First Lines, under the title of Hysteria, appear, I take this to be the genuine form that may be strictly so named; and to be a disease of one determined kind, and occurring perhaps only, at least especially, in females of a sanguine and somewhat plethoric temperament. But without prosecuting the history of the disease any farther, I must maintain what I have had confirmed by experience, that in the form mentioned, the bark is not a remedy adapted to it.

There are, however, a great number of ailments which are frequently named hysteric, or more commonly nervous diseases, that are of very great diversity; and by their symptoms, not to be brought under any general character. If therefore we are to attempt any thing with regard to their general nature, it must be by presuming to establish a general cause. This I allow to be an uncertain plan; but I do not know at present how to do better.

In attempting this, I would refer the nervous diseases to one or rather two general causes: the one is, a weakness of tone, and thence a mobility of system, in sanguine temperaments, or in such as are not manifestly melancholic; and the other is, in melancholic temperaments, a more or less torpid state of the nervous power prevailing; in consequence of which, various irregularities in the functions of the nervous system arise.

All this would need much explanation; but I cannot attempt that here: and I do not think myself sufficiently prepared to enter upon it fully. The only use I can make of it at present is to say, that wherever morbid affections of the chronic kind can be perceived to depend upon a weakness of tone, and mobility of the system, chiefly appearing in symptoms of dyspepsia, the bark is likely to prove an useful remedy; but that in the cases of torpor with firmness of tone, it is likely to be not only an useless, but even a hurtful remedy. The latter I take to be the case, in what I would strictly name Hypochondriasis. Of this, indeed, medical people have various notions, but seldom clear or well digested: and if some have asserted that they have found the bark useful in cases of hypochondriasis, I suspect they have not properly distinguished between hypochondriasis and dyspepsia. The latter may be frequently attended with timidity, doubt, and despondency: but it may still be a very different disease from the proper hypochondriasis.

I have thus endeavoured to consider the use of the bark in all the variety of disease in which it may be applied, or in which it has been commonly employed: and upon the subject it remains only to say, in what manner it may be most properly exhibited: but this I think I have done pretty fully on the subject of bitters;

and I have only now to say, that every thing said with regard to preparation and formula on the subject of bitters, is entirely applicable to the bark.

SALIX ALBA.

This has been proposed as a substitute for the bark : and upon that account I have set it down here. The testimonies of *Stone*, *Clossius*, and *Gunzius*, are very strongly in its favour: and altho' we have not had many opportunities of employing it in intermittent fevers, the few that have been made, show that it may be in some cases an effectual remedy.

The sensible qualities seem to me to be that of a pretty strong, but sufficiently agreeable bitter, with somewhat of stypticity. These qualities persuade me that it is a valuable medicine, and to be as promising a substitute for the bark as any I have known to be offered.

The trials I have made were with the bark of the *Salix Pentandra*, taken from branches of a third of an inch diameter, and of four or five years growth. I must not, however, dismiss the subject without acknowledging that *Bergius* tells us, that several trials he had made with this bark in intermittent fevers, were always without success.

CHAPTER III.

OF EMOLLIENTS.

THESE are medicines which diminish the force of cohesion in the particles of the solid matter of the human body, and thereby render them more lax and flexible. Their action is most evident upon the simple solid, and they may possibly also act upon the solid matter of the moving fibres; but except it may be by the heat that is frequently joined with them, they do not seem by their chemical qualities, to act upon the nervous power. The powers which act upon this in diminishing the contractility or tone of the moving fibres, will be considered hereafter, under the title of Sedatives.

The emollients we are to treat of here, seem to act upon the parts to which they are immediately applied, in one of two ways. The one is, by being insinuated into the substance of the solid; and thereby diminishing the density of the whole of the mixt, they diminish its force of cohesion. The other is, when by being insinuated into the interstices of dry particles, they diminish the friction that might otherwise occur, and thereby render the whole more flexible. The former seems to be the operation of water, the latter that of oil; as we shall see more particularly hereafter.

The operation of emollients is most considerable in the parts to which they are immediately applied; but as the whole of the solid matter of the body is constantly of a preternaturally extended state, and as at the same time the several parts are so connect-

and as to form one continuous body; so the tension of the whole must in some measure depend upon the tension of every particular part. It is therefore that the relaxation of any one part must in some measure affect the whole. It is, indeed, in this way that the effect of emollients is often extended much beyond the part to which they are immediately applied.

As, however, the effect of emollients is still most considerable in the part to which they are immediately applied, it will be evident that their effect will be most considerable upon the surface of the body; and it is a question how far they can be rendered so in the internal parts. Upon this subject it may be readily imagined, that as they may be applied to the internal surface of the alimentary canal, that their effect there may be very great: and altho' I would not maintain that they must be none at all, yet I am disposed to think that, except in the mouth and fauces, or the great guts to which they can be copiously and immediately applied, they cannot, in the other parts of the alimentary canal, be very considerable. The internal surface of the stomach and intestines are very constantly covered with a considerable quantity of mucus, not readily diffusible in water, and therefore likely to prevent the insinuation of water or oil into the substance of their coats.

Their effects here must also be less, as they are unassisted by any additional heat, which is often required in their action upon the external parts: and another circumstance which may prevent their action upon the alimentary canal is that their application to any particular part can never be very durable; as water, the chief form of emollients, must be very quickly carried on in progressive motion, or quickly withdrawn by absorption. I have known two pounds of water absorbed from the rectum in the space of an hour.

If the action of emollients in the alimentary canal be in any measure doubtful, it must be still more so with respect to the blood-vessels. Here even a large quantity is slowly introduced; is soon very much divided; can never be applied in large quantity to any one part; and must always be mixed with a quantity of fluid not very penetrating. At the same time, it is applied to the surface constantly covered with an exudation not readily miscible with water; and with all this, it is constantly in a rapid progressive motion, by which it must be soon carried entirely out by the several secretions and excretions.

From all these circumstances it would appear, that emollients, as watery, can hardly ever have any action in the system of blood-vessels: and therefore, to explain the action of emollients upon the system of solids, I am almost confined to consider only their action upon the external surface of the body, or in the parts immediately subjacent.

In considering the action of emollients upon the external parts, it may be a question, whether water of a lower temperature than that of the body itself, can act as an emollient?

We are of opinion, that while water is at such a temperature as to give a sensation of cold, it cannot have any emollient effect: but we know that if water, of a temperature any thing above 62 in *Fahrenheit's* thermometer, continues to be constantly applied, it soon ceases to give the sensation of cold which it gave on its first application; and after a short time it gives a sensation of warmth. In this condition, that is, water at any temperature above 62, that is continued to be applied till it gives a sensation of warmth, may act as an emollient.

It is however to be observed, that the greater the warmth, if within the bounds the skin will bear without pain, the greater its emollient power will be; both because the heat will render it more penetrating, and because the heat, within the bounds mentioned, contributes also to the softening and relaxing the simple solids.

It likewise appears to me that water penetrates more powerfully in the state of vapour than in its liquid form; and as, in order to be converted into vapour, it requires a considerable degree of heat; so it is found that the human body will bear a greater degree of the heat of water, in the state of vapour, than in its liquid form: and therefore, that cloths wrung out of boiling water, if so wrung as to give only a vapour, may be more safely applied, and with more advantage, as emollients, than liquid water.

The application, however, of heat, must always be limited, so that the stimulus of the heat be noways inconsistent with the purpose of the emollient. Thus *Dr. Wnuttingham*, the elder, has remarked, that warm fomentations applied to the pained joints at the beginning of acute rheumatism, increases the pain, and aggravates the disease.

Whether emollients be applied in vapour or in a liquid form, it is found, that to give them effect it is necessary that the application be continued for some length of time; and therefore benefit is often obtained by the emollients being applied in the form of poultice; whereby both the moisture and heat may continue to be applied for a long time.

There is a manner of applying emollients, or warm water as such, by making it fall in drops from some height, upon the part affected, and which by the French is called a *douche*. Whether in this manner the water penetrates more readily or fully into the substance of the part, I cannot positively determine; but I can hardly think it does: and am inclined to be of opinion that the *douche* acts only by a mechanical power, exciting an oscillation in the vessels of the part, which, analogous to friction, may sometimes resolve obstructions, or excite the sense and motion in paralytic parts. I can in no other way explain the effects of pumping water upon any part.

Having thus considered the operation of emollients in general, I proceed to consider their effects on the human body more

particularly.—As the cuticle is often in a dry and constricted state, the application of emollients will soften and relax this, and thereby, in some measure, take off the tension of the subjacent parts. But it appears to me, that, in many cases, the operation goes no further.

The operation of oil seems to be chiefly upon the cuticle, composed very entirely of numberless dry squamæ, and between which oil being insinuated renders them more readily moveable upon one another, and the whole, therefore, more lax and flexible.

As it may be presumed that warm water or vapour penetrates in some measure, into the substance of the skin itself, it will therefore relax not only the cellular texture of this, but likewise the coats of the numerous blood-vessels laid in its texture. By this relaxation of the common teguments, the tension of the subjacent parts, particularly of the muscles, must be considerably diminished: and in proportion to the extent of that, the relaxation of the whole system. The effects are more particularly to be observed when the parts are under a state of inflammation; as in that case the vessels are distended, and thereby irritated; so the relaxation of these vessels, by favouring the more free transmission of the fluids, may thereby diminish the irritation which had perhaps been communicated. As the action of the heart and arteries is often increased and supported by a spasmodic constriction of the extremities of the vessels on the surface of the body; so the relaxation of that constriction, by emollients applied, may often take off the irritation of the heart and arteries.

Emollients, by relaxing external parts, may take off spasms of internal parts particularly connected with these; and thus the relaxation of the teguments of the lower belly often relieves the spasms of the intestines which take place in colic and dysentery.

Emollients applied to any one part, both by relaxation and stimulus, must determine the fluids more copiously into that part, and diminish the influx of them into others; and accordingly emollients, by relaxing the extremities of the vessels on the surface of the body, must favour perspiration and heat, as well as at the same time take off any determination to the internal parts: Thus also pediluvia, when they do not prove stimulant to the system, must diminish the determination of the blood into the vessels of the head.

As the flexibility of the solids is increased by the more free and frequent motion of their particles upon one another; so, if the application of emollients be accompanied with much friction, the flexibility of the solids must be greatly increased by it, and particularly by its mechanical operation, the action of the blood-vessels in general, as well as the more free motion of the fluids, must be greatly promoted, and thereby obstructions may by this means be often removed.

It is further to be observed, that as the flexibility of the solids depends upon, and is maintained by, the motion of their par-

ticles upon one another; so, by long rest, that flexibility is destroyed, and a rigidity induced, which is to be recovered chiefly by the employment of emollients with friction. The motion of a joint is frequently destroyed by the rigidity of one set of its muscles contracted by the want of motion I have mentioned: and the motion of such joints is only to be recovered by the cure of that rigidity in the manner I have just now said.

Thus far with respect to the effects of emollients on the system of blood vessels and of the moving fibres: but it is farther to be observed, that as the warmth and humidity applied to the surface of the body, are applied to the extremities of innumerable nerves terminating in the skin, and constituting there a peculiar organ of sense; so it is probable, that this application has considerable effects upon the nervous system, both by relaxing and stimulating, and may in this way contribute greatly to many of the effects above mentioned.

We have now only to add, that the effect of emollients is hardly to be obtained but by their application long continued at one time; and we can hardly ever find the continuance of an hour less than sufficient.

PARTICULAR EMOLLIENTS.

Emollients are applied either in a watery or in an oily form; and the emollient that deserves to be first mentioned, is simple water warmed either more or less. Whether any choice of water be very necessary, we are doubtful: as we believe that every kind of water, which may be comprehended under the title of simple water, that is, water without taste or smell, must be nearly of equal power as an emollient: but if a choice can be made, the softest water may have some little advantage over the hard.

The virtues of water as an emollient may be understood from what has been said of emollients in general; for all the effects there mentioned can be obtained most certainly by the application of simple water warmed. Whether any advantage can be gained by any addition made to water, I am doubtful. It is possible, that if oil can be blended intimately with water, this might perhaps carry the oil so blended with it into the interstices of the solid parts, and thus more effectually induce a relaxation: but I know of one way only by which such a mixture can be obtained, and that is, by adding to water the milk of any of our domestic animals: and as milk immediately taken from the animal that affords it, contains an oil already intimately blended with the water, so it may possibly, as common practice supposes, be an effectual emollient, either by itself or as added to water. This I presume from theory; but I have not been able to perceive the emollient power of milk to be greater than that of simple water. In *Dr. Brian Robinson's* Table of the effects of different substances applied to hairs, marking the extensions produced by different fluids, the cream of cow's milk is 23 3-10ths; cow's milk

skimmed is 26 : water cold is 35 ; water hot is 80. That table might give occasion to some remarks and reflections on the power of emollients, and I shall perhaps make some ; but to consider the whole, would lead to subtle speculations, which, as I cannot find them applicable to practice, shall be passed over here.

Practitioners have commonly attempted to improve the emollient virtue of water, by employing the decoctions of several plants ; but except it be those of the mucilaginous kind, which I shall consider by themselves, I cannot perceive that any of the others are employed with advantage.—The oleraceous plants, as the *Atriplex*, *Beta*, *Spinachta*, and *Chenopodium bonus Henricus*, have been employed ; and some others also, as the *Alsine*, *Acanthus branci Ursina*, *Mællotus*, *Parietaria*, and some others. But as none of these mentioned contain any thing mucilaginous, and that, by *Dr. Robinson's* table above referred to, it appears that all saline matters joined with water, render it less penetrating ; so I judge the plants mentioned as emollients to be absolutely insignificant. In some lists of emollients, as in that of *Mr. Lieutaud*, there are still greater inaccuracies to be found. Amongst the emollients, he inserts the radices nymphææ et lathyræ, which are astringents ; the flores chamamæli and sambuci, which may have their virtues, but are not emollient, except in so far as they are accompanied with warm water.

Of the vegetable substances which, joined with warm water, may be supposed to increase the emollient powers of this, are especially those that afford a mucilage, as the roots and herbs of the Columniferae ; all of which give out more or less of a mucilaginous matter. The *Althæa* and *Malva* are those chiefly employed. Their demulcent virtue shall be considered in its proper place hereafter : and, as emollients, which gives them a place here, I judge them to be very inconsiderable, as I think they must rather impede than increase the solvent power of water. The only advantage that can be derived from them seems to be, that as warm water washes off any unctuous matter that commonly besmears the cuticle ; so, when the water is again evaporated, it leaves the cuticle more dry than it was before : and it is possible that water impregnated with mucilaginous matter, in being again evaporated, may leave some portion of the mucilaginous matter behind, and thereby obviate the dryness of the cuticle which might otherwise occur.

For impregnating water with mucilaginous matter, a great variety of farinaceous seeds have been employed ; and those especially, which have much oil blended with their farina, as the linseed, have been properly preferred. This, and the others that might be employed, will come under consideration hereafter, under the title of Demulcents. And with respect to them now as emollients, I have the same observations to make as I have made just now with respect to mucilages : and I am persuaded, that the more oily nature of the farinacea will still more diminish the

emollient virtue of water ; but in another respect they may have some advantage. As we have said that emollients may have more durable effects, as applied in the form of poultice ; so, as the farinacea are commonly employed for this purpose, the more oily kinds, as less liable to dry, will always be the best. Whether, however, the adding of oil or unguinous matter to a poultice of other farinacea, may not answer the purpose better, I leave to the surgeons to determine.

The other form of emollients is the oily ; and all the mild oils of vegetables, and all the oils and fats of animals, have been employed as emollients. The operation of them in general I have mentioned above ; and it is chiefly that of producing a greater flexibility in dry matters. In this way they operate especially upon the cuticle ; and may thereby, in some measure, take off the tension of the subjacent parts. That the mild oils we have mentioned ever penetrate into the substance of the skin, I cannot perceive ; and when they are seemingly taken in from the surface, I believe it is always by absorbing vessels. This absorption, though it certainly takes place, is certainly never in considerable quantity ; and in being carried on by the absorbing vessels, cannot be supposed to have much, if any, effect in any of the parts through which these vessels pass.

As we have observed above, that friction, joined with the application of emollients, may be of service in exciting the action of the vessel, so this friction can only be applied conveniently with oil anointed on the fingers or hands employed in rubbing ; and this opportunity of friction is one great advantage obtained by the employment of oils. The effects of very gentle friction, long continued, seem to be very considerable, by its exciting a constant oscillation in the vessels of the subjacent parts : and by the oscillations excited in the nerves of the skin, these effects may be propagated to very distant parts. I know from my own experience of it, that by a friction with oil long continued upon the teguments of the lower belly, the action of the urinary passages may be strongly excited, and a copious flow of urine be produced. This practice, indeed, does not always succeed ; but it has in several instances, and I have never found it to do any harm.

It has commonly been supposed, that the application of oil to the skin might stop up its pores, and hinder perspiration ; but, from several considerations, it appears that there is no just foundation for this : and the very general practice of the ancients, as well as of the Asiatics in modern times, is a certain proof of the contrary.

For the purpose of oily emollients, a great number of oily substances have been proposed and employed ; and among these commonly proposed, I cannot find much difference. The various mild expressed oils of vegetables are all of them very nearly of the same nature ; and if any distinction was to be made, it would be by choosing the most fluid in preference to the more

mucilaginous : and, on this footing, I would prefer the oil of olives to that of lintseed. From the same consideration, I would prefer the vegetable oils to the animal fats ; but this hardly deserves attention in practice. Among the animal fats, practitioners some time ago made a choice, and supposed that the fats of certain animals had peculiar virtues ; but the supposition seems now, at least in Britain, to be very entirely abandoned : and I cannot perceive that there ever was any foundation for it. Some of them in pharmacy, may, by their consistency of colour, be better suited than others to certain formulæ : but that is now so well ascertained in common practice, as to need no illustration here.

CHAPTER IV.

C O R R O S I V E S.

THESE are otherwise called Caustics, Erodents, and Escharotics. They are all of them substances which dissolve the solid matter of the human body ; and they are indicated in all those cases in which either a portion of the solid matter is to be taken away, or when the texture of it is to be destroyed, so as it may either spontaneously fall off, or, by mechanical means, may be easily separated from the other parts. When such an indication arises, I leave my readers to learn from the principles of surgery ; and also, from the same, to learn when this method is preferable to that of a mechanical excision.

The operation of caustics, whilst any living principle subsists in the part to which they are applied, is always attended with pain, and may thereby prove a considerable irritation to the whole system : but this is an effect in common to these with many other stimulants, and is not therefore to be considered here, but under the general head of stimulants, in the next article. The same thing is to be said of their use in exciting a discharge of pus ; which, as it may be done by other means, is not necessary nor proper to be considered here. It only remains for us, in this place, to say what the particular corrosives are, with some remarks on their difference, for the purposes of practice.

As solvents of animal matter may be mentioned in the first place, the acids which can be obtained in a very concentrated state, such as the vitriolic and nitrous ; these, therefore, may be employed as caustics ; but their fluidity makes it difficult to confine their application to the parts which are only to be properly consumed, and therefore it is that they are seldom employed.

The caustic most generally employed is the fixed alkaline salt, when separated from the ærial acid which commonly accompanies it : and accordingly, when it is thus suited to the purposes of the present indication, it is said to be in its caustic stste. How the common fixed alkali is brought into this state, and how it is

to be managed as a caustic, are matters vulgarly known, and not necessary to be mentioned here.—*Dr. Edward Barry*, in the *Edinburgh Medical Essays*, has proposed the employment of a caustic of acid and alkali alternately applied. The scheme is specious, but has not succeeded with us; and I believe will not at all answer, except where large masses are to be consumed, and where the spreading of the acid can do no harm.

The caustic qualities of acids, though entirely destroyed by their being combined with alkalines and earths, are not so by their being combined with metals. The nitrous acid combined with silver, gives the lunar caustic very commonly employed; and the muriatic acid, in a concentrated state, joined with antimony, gives what is commonly called the butter of antimony, one of the strongest caustics known. These metallic caustics are attended with the same inconvenience as the simple acids; that is, of being ready to spread beyond the bounds intended for them: but this is more easily managed with respect to the lunar caustic, which can be got in a solid form, than with respect to the butter of antimony, necessarily liquid; and this gives the reason why the latter is more rarely employed.

It is here to be observed, that these corrosive matters are in different degrees of strength; and when they are not sufficient to dissolve the more solid parts, they still may be fit to dissolve those more tender fungous excrescences which arise in ulcers. Thus it happens, that alum having a considerable portion of its watery parts exhaled, and its acid thereby concentrated, is thereby rendered capable of consuming the fungous growth in ulcers. It is, however, always a weak escharotic; and we have a stronger kind in the preparations of mercury and copper. Both these preparations are noted for their cleaning foul sores, bringing them to discharge a proper pus, so necessary to their healing; and I ascribe all this to their escharotic power.

A specific power might, in certain cases, be supposed in the mercurials; but this cannot be supposed in the preparations of copper, which, however, often answer the purpose as well. In practice the force of the latter cannot be so well measured or limited as the former; and therefore the dry red precipitate, as less likely to liquify and spread, is commonly the most convenient application. It has been common to mix this with unguinous matters; but this very much diminishes its powers, and is very seldom necessary.

CHAPTER V.

OF STIMULANTS.

ACCORDING to the plan laid down in our prefixed table, we are now to consider the medicines that act more entirely upon the living solid.

The idea commonly annexed to the term Stimulant, is that of a power suited only to excite the action of moving fibres. But I am here to consider stimulants more generally, as exciting the motion of the living principle, whether producing sensation or as producing the action of moving fibres.

Very generally, indeed, the motions begin in the former: but it is not necessary, as some have supposed, that they should always do so; for there are powers, which, directly applied to the moving fibres, excite their action without any previous sensation excited, or without any intervention of the brain; which appears clearly from hence, that the motion of moving fibres can be excited so long as the living principle subsists in them, though they are entirely separated from the rest of the body, and entirely therefore removed from all sense.

The operation of stimulants, either in an extensive or more limited view, is difficult to be explained; because our knowledge of the living principle or nervous power, and of the various modifications of the different states of its mobility, is still very imperfect. Some have imagined, that the operation of stimulants might be mechanically explained by the figure of their particles: but while the Corpuscularian philosophy is at present so much deserted, we do not think it necessary to take any pains to discuss the fatuities advanced on this subject: and however it may be, it seems enough to observe, that we know in general that the nervous power may be in different states of mobility, and that there are substances which, applied to the nerves, have a power of increasing or diminishing the mobility of the fluid contained in them. The former we name Stimulants, the latter Sedatives.

This then is the general idea of stimulants, that they are powers capable of increasing the mobility, and of exciting the motion of the nervous power. Here, however, it is proper to remark, that by the nervous power being acted upon by stimulants we strictly mean not only that fluid which is readily moveable in the brain and nerves, but also that fluid which is under a peculiar modification in the moving fibres, and gives them what we name the inherent power. It is fit also to remark here, that in this manner we must distinguish between stimulant and tonic powers, which both act upon the same power, and have been commonly confounded together. Although they may mutually increase the effects of each other, they are still in their nature and operation to be considered as distinct and different, though we cannot clearly explain wherein the difference consists.

Having thus given my general idea of the operation of stimulants, I proceed to consider the various modifications of that operation as it is determined either by the circumstances of the parts of the body to which they are immediately applied, or by the various nature of the substances that may be employed to act.

In the first place, we shall consider them as they are applied to organs of peculiar sense, which are excited by the impressions

of certain matters only ; or as they are applied to parts which have a sensibility in common with the whole of the nervous system, and when their effects are modified by the state of the moving fibres in the parts adjoining.

With respect to the whole of the stimulants applied to the organs of sense, we have to remark, that the exercise of sensation is in general a stimulant power ; and is a chief means of supporting the mobility of the living principle in the nervous system ; more especially in what concerns the animal functions.

It relates also to all the cases in which sensation is produced, to remark, that the effects of the stimulus seem to be in proportion to the force of the impression producing them. As a certain degree of this is on many occasions necessary to render them pleasant ; so in proportion to the pleasure arising from them, their stimulus is greater : and farther, as all strong impressions give pain ; so in proportion to this also, they are more strongly stimulant.

From certain other circumstances, beside that of force, sensations are either agreeable or disagreeable ; the former being always stimulant ; the latter being, as I judge, always sedative, or perhaps indirectly stimulant, as we shall explain hereafter.

Of particular sensations, these of light and noise have their stimulant effects in proportion to their force ; or sometimes independent of that, according to certain circumstances rendering them more agreeable.

Odours are very much on the same footing ; but have often more immediate and strong effects on the sensorium ; and to explain that, it may be observed, that with respect to other parts of the system, the medical virtues of many substances seem to depend upon their odorous parts ; which seem to point out their particular activity with respect to the nervous system.

Sapid bodies do not so readily or powerfully affect the sensorium. But the activity of sapid substances applied to other parts, often corresponds with the force of their impressions upon the tongue.

In considering the operation of substances upon the skin, it is not always easy to distinguish the effects of impressions applied to what is strictly the organ of sense, from the effects of impressions made upon that sensibility which the skin has in common with all the other parts of the nervous system.

It seems to be an operation on the nervous papillæ of the skin when a certain gentle undulatory motion applied to the skin produces a sense of tickling, which often proves stimulant. It is also chiefly an operation not only upon the same organ, but partly also upon that of the common sensibility ; when certain substances applied to the skin produce a sense of itching, which is always stimulant, and often continues till it produces redness and other circumstances of inflammation.

These are the observations which I can make on the action of

stimulants applied to organs of sense: and this in general is to be remarked, that though we should expect that impressions upon these organs should be especially and only communicated to the brain, and although (which is truly the case with all moderate impressions) exciting peculiar sensations, which for the most part act only upon the brain, and little or none at all either upon the organ itself, or upon the parts immediately adjoining to it; yet all strong impressions seem to act very often more on the neighbouring parts than upon the brain or general system depending upon it.

The action upon the neighbouring parts seems to be especially the exciting of the action of the blood-vessels of the part immediately adjoining to the organ of sense. Thus, a strong light excites a stronger action in the numerous blood-vessels intermixed with the nerves of the retina. What happens in the ear we do not know. But strong odours inflame the internal membrane of the nose: and strong and painful impressions upon the tongue inflame the surface of it. What happens on the skin I have mentioned above; and I gave that as an example of the action of stimulants, both on parts which are not organs of peculiar sense, and on those which have only the common sensibility of the nervous system.—Such are also all the internal surfaces, in which therefore we perceive only the effects of stimulants by their producing inflammation on their surfaces.

But we are now to consider the operation of stimulants upon the parts that are endued only with the sensibility that is in common to the whole of the system: and we cannot illustrate this better than by marking their action upon the skin.

When certain substances are applied to the skin, the first sensation they produce is that of heat in the part: and commonly at the same time some redness appears upon the surface, which I take to be a mark of an operation upon the blood-vessels of the skin. There is frequently, indeed, at the same time, a sense of pricking pain: yet often without that, the effect chiefly consists in an increased action of the vessels mentioned, and which accordingly proceeds to every circumstance of inflammation, as pain, tumour, blistering, suppuration and gangrene. In many cases, some of these effects are produced in the part, without their being communicated to the rest of the system: and I consider them therefore as an immediate operation upon the moving fibres of the vessels of the skin, without the intervention of sensation, or of any action of the brain.

It is indeed true, that in many cases, a sensation arises, and that a stimulus is communicated to the brain: and the symptoms of its increased energy, as a preternatural frequency of pulse, and, in consequence of this, an increase of heat over the whole body, is produced. But it is to be remarked, as often happening, that the stimulus communicated to the brain is not in proportion to the inflammation produced in the part, which we have

occasion frequently to observe in those paralytic cases in which we apply inflammatory stimulants to particular parts.

These are the general effects of stimulants on the parts to which they are immediately applied : But I am now to mention what is a very important particular of the animal œconomy, which is, That many stimulants have little effect on the parts to which they are immediately applied, but excite motions in other, and sometimes very distant parts of the body. These motions, however, have commonly a relation to the parts to which the stimulus had been immediately applied ; and they are commonly such as are suited for throwing off the stimulant matter from those parts.

Such are the motions of sneezing, hawking, coughing, vomiting, and the voiding of urine and feces. In all of these, the motions are excited by an uneasy or painful impression from a matter applied to certain parts : and the motions excited are manifestly fitted for throwing off the irritating matter from these parts.

These phenomena have been commonly explained upon the supposition of a certain consent of nerves between those of the parts irritated and of the parts acting ; but no particular connection of nerves can be found, that will account for the exciting of these actions, without their exciting at the same time many others ; and it must be referred to an institution of nature which we cannot explain, and can only say, that the motions excited are suited to the general purpose of nature, either to resist and avert injuries from external causes, threatening the animal œconomy, or to produce certain actions necessary to that œconomy. Of the latter kind are the evacuations of stool and urine ; and of the former are the other motions of sneezing, hawking, coughing, and vomiting.

In illustration of this, it may be remarked, that the same actions are produced by stimuli applied to very different parts, if these actions are suited to the purpose, as we may call it, of these different parts. Thus a full inspiration, and a concurring contraction of the abdominal muscles is produced by a stimulus applied to the stomach, or by an uneasy sensation at the neck of the bladder, or by a like sensation in the intestinum rectum.

These may separately excite the full inspiration ; not therefore from any particular consent of nerves, but merely from its being necessary to the purpose of nature : and accordingly it is excited, not only on these occasions, but on every other where nature intends a strong exertion of strength, to which a full inspiration is always necessary.

It is farther to be remarked, that it is the administration of nature in the business of the animal œconomy, which not only excites those motions, but also regulates the force with which they are exerted to be more or less, according as the occasional circumstances may require. Thus, a sensation that excites to an

evacuation of urine, if the urinary bladder be full, and there is no resistance to the issuing of the urine, the inspiration produced will be to a very moderate degree only: but if there be a resistance to the evacuation of urine, the inspiration and other concurrent actions are excited to a greater degree, and with greater force.—That the business in such cases is directed by the purpose of the æconomy, and not by the consent of nerves, appears further from hence, that is not one set of actions, all of them constantly excited by the same stimulus, but more or fewer, according to the strength of effort that is necessary. Thus, the sensation exciting an evacuation by stool, according to the force on that occasion to be exerted, produces the action of more or fewer parts of the body. Not only a very full inspiration and a strong contraction of the abdominal muscles are produced, but a contraction, in order to a general tension, takes place in almost every muscular fibre of the body. The fists are clenched, or the hands grasp some fixed body very firmly; and even the muscles of the cheeks are often very strongly contracted.

There may seem to be some mystery in all this; but no person will be stumbled with respect to this part of the animal æconomy who considers the ordinary operation of the will. This does not directly or consciously direct the action of any particular muscle: but willing only an end and purpose, the muscles fitted to execute or produce this end are immediately brought into action.

The actions we have mentioned are the effects of stimuli, which we suppose to be powers exciting the motion of the nervous power; and though the effects are determined by the will or propensity, we still suppose the general power of the substance acting, and are therefore what we call direct stimulants. It is now, however, to be remarked, that there are motions excited in the body without the application of such stimulants, and by circumstances of a contrary kind; that is, merely by a sense of difficulty, of resistance, or of debility, in the exercise of functions.

Thus, sighing manifestly arises from a sense of difficulty in the transmission of the blood thro' the vessels of the lungs. Coughing often arises from the same sensation, without any direct stimulus applied to any particular part of them. Vomiting often arises merely from a sense of debility, as when it accompanies a syncope, from causes which cannot be supposed to operate directly upon the stomach: and the vomitings so frequently produced by narcotics seem to me to be more properly explained by a sense of the debility induced by them, than by their affording any direct stimulus. We explain in the same manner the yawning and stretching which occur to persons coming out of sleep, and on some other occasions, when no other cause can be supposed than a sense of some difficulty in the exertion of voluntary motions.

These seem to afford unquestionable proofs of a power in the animal æconomy, to obviate and correct certain deviations from the standard of health; and both these, with the instances given

above, of direct stimuli producing motion suited to throw off matters applied which give pain and uneasiness, or that may prove noxious to the system, concur in showing, that there is in the animal æconomy a power to obviate and correct, in a certain degree, every thing not suited to the health of the æconomy, and which has properly enough been named the *Vis Naturæ Conservatrix et Medicatrix*.

After so many evident instances of this, we can hardly doubt of the like powers taking place also in the more obscure internal parts, in many cases of disease which are spontaneously cured by the operations of nature; or, in other words, by the spontaneous powers of the animal æconomy; and particularly that the state of the circulation is often regulated so as to be excited to a stronger action, merely by the occurrence of resistance or debility. All this particularly applies to render it probable, that the effect of sedatives, exciting the action of the system, either in general, or of particular parts, may be explained entirely by their being effects of a *vis medicatrix naturæ*, obviating injuries which threaten the whole system or particular parts. And to finish this subject, nothing can better show that active powers can be excited merely by a sense of debility, than this, that if a stimulus accustomed to support the activity of the system, happen to be withdrawn, the sense of debility thence arising produces various actions in the system, or in particular parts. All these means of exciting the action of the system, or of particular parts, we name *Indirect Stimulants*.

After thus mentioning the operation of stimulants as chiefly applied to external parts, we proceed to consider their application to the internal; and which is especially by their being taken into the stomach. Here they may operate, in the first place, upon the moving fibres of the stomach itself, exciting their action for the purposes of digestion; or to a higher degree, for exciting vomiting, which we shall consider hereafter under the head of Evacuations: or, in the second place, stimulants may act on the stomach as a peculiar organ of sense. Here it is surely needless to say how readily and constantly all impressions made upon the stomach are communicated to other parts of the system, and particularly to the origin of the nerves.

It is possible that impressions made upon the stomach, without the intervention of the brain, may be communicated to several parts of the system, and particularly to the surface of the body, or to parts under disease, and therefore under a state of uncommon irritability; but these are uncommon occurrences, and I cannot readily ascertain, with any clearness, the circumstances and cases in which these especially occur. I believe the most common and very general manner in which stimulants taken into the stomach operate, is by their stimulus being communicated to the brain; and that by exciting the energy of that, various effects are produced in different parts of the system.

Upon these occasions the operation may be especially distinguished, as being of different degrees of force. In some cases, it seems to amount to no more than the increasing of the mobility of the nervous power in the brain itself, and thereby rendering the exercise of the intellectual powers more free, easy, and active. Probably at the same time, or at least with some higher degree of force, they render the derivation of the nervous fluid into the several parts of the system, especially into the nerves of the voluntary functions, more free and full; without, however, producing any uncommon increase of it in particular parts, to which a will or propensity is necessary.

Another case of stimulants applied to the stomach, is, when the stimulus applied is of a still stronger kind, and in consequence, a still stronger impulse is communicated to the brain, and when consequently a stronger exertion of its energy is produced. This, however, without particular determination, may have no effect upon the animal functions: but as we have said before, that the energy of the brain is constantly exerted in supporting the activity of the vital functions of the heart and arteries; so any unusual increase of this exertion may increase the force and frequency of these functions. Thus the effects of certain impressions on the stomach may be to increase the force of the circulation of the blood, and especially its most general determination to the surface of the body; whence the heat and sweating which commonly ensues. Thus the operation of stimulants in the stomach, may be distinguished by the different degrees of its force: and this, I expect, will serve as a foundation for the consideration of particular stimulants hereafter.

The operation of stimulants taken into the stomach is not always exhausted there; for they are often carried on, very much unchanged, into the intestines; and there also operate, in the first place, upon the fibres of the intestines analogous to the like operations upon the stomach. They increase and render more steady the action of the moving fibres: and I have no doubt that the stimulant power from the intestines, as well as from the stomach, may be communicated to the brain, though it is probable that the stomach is endowed with more sensibility suited to this purpose.

The action of stimulants on the intestines to such a degree as to produce purging, I delay considering, as I have done that of vomiting, till I come to treat of evacuations.

As many of our stimulants are very little changed in the alimentary canal, so they are carried with their entire power into the blood-vessels; and we are therefore to consider what may be their operation there. We judge it to be very little; 1st, Because they are there necessarily diffused in a great quantity of liquid, which must very much weaken, if not entirely destroy their operation. 2ndly, Because they are there involved in a quantity of viscid fluid; such as we know, in all cases, to weaken the action

of stimulants. And lastly, because we believe the internal surface of the blood-vessels to have very little sensibility, and therefore little liable to be affected by weak impressions. From all these considerations, we consider the operation of stimulants, taken in by the mouth, to be in the blood-vessels very little; and know of no observation or experiment that leads us to think otherwise. I am of opinion, that any such effects as have been supposed, can be better explained by their operation on the stomach and brain.

We still, however, know that many stimulant matters are carried into the blood-vessels, and are carried off by several excretions: and as we may justly impute their inert state in the blood-vessels to their being there extremely diffused; so, when they are again accumulated, and as it were concentrated in the secretory organs, they may there operate in promoting the different secretions. Of this we have many instances; but I delay considering them till I shall come to treat of the evacuations they occasion.

To give a full treatise of stimulants, we should consider the powers of heat, cold, and electricity; but as not strictly belonging to the *Materia Medica*, we pass them over here.

Having now considered the operation of stimulants in general, I have only to conclude the subject with mentioning, that with regard to all of them, they are subjected to the laws of custom; and that, therefore, considered as impressions, their power by repetition is constantly diminished; but that, considered in their effects, the actions produced by the repetition may become more readily excited, and thereby the power of stimulants may seem to be increased.

PARTICULAR STIMULANTS.

WE begin by mentioning those which, with a botanical affinity, have much of a common virtue: and in the first place, therefore, the *A. VERTICILLATÆ.*

These are a numerous order, many of which have their virtue depending upon an essential oil, largely abounding in them, as produced by nature. As, however, the effect of botanical affinity is not complete in exhibiting the same qualities in all of the same order; so those of the *verticillatæ*, which have little or no essential oil, such as the *bugula*, *brunella*, and *lamium*, are neglected as medicines: or if there be some which, with little essential oil, are still retained in practice, it is on account of the bitter and astringent qualities which are found in many of this order. Even of those abounding in essential oil, all are not here enumerated; as, though they have the common qualities, they have them not in a higher, or perhaps not in so high a degree, as those more common in our shops. But to be still more particular, I begin with *BETONICA.*

This, tho' formerly much celebrated, is now omitted in the catalogues of the British dispensatories; and in my opinion ve-

ry justly ; as it has the common qualities of the *verticillatæ* in a very slender degree : and I mention it here merely as an example of what frivolities are repeated after ancient writers, and also as an example of very ill-grounded popular opinions which have prevailed not long ago. *Antonius Musa*, the physician of Augustus Cæsar, is said to have given a treatise on botany ; in which he has mentioned this plant as a remedy against forty-eight different diseases : and amongst the Italians it has been considered of so great and almost universal virtue, as to introduce the maxim of *Vende la tonica, e compra la Betonica*.

HEDERA TERRESTRIS.

This is another instance of the uncertainty of popular opinions, however generally prevailing : and the opinion of the English of the *hedera terrestris*, seems to me to be no better founded than that of the Italians just now mentioned.

The sensible qualities of the *hedera terrestris* do not promise much virtue, either in its recent state or in any of its preparations ; and *Cartheuser's* account of the extract, I suppose to be founded on some mistake ; as the same qualities do not at all appear in the extracts from a recent plant, which we have prepared with all possible care.

With respect to this plant, the accounts given of it by *materia medica* writers seem to me to be no better founded than the opinions of the vulgar. That it should be powerful in curing ulcers of the lungs, and various cases of phthisis, seems to me very improbable ; and the authority of *Simon Paulli*, or of the others adduced on this subject, have very little or no weight with me against the consideration of the nature of such diseases, and of the general difficulty of curing them. Its use in calculous cases is not supported by any better authorities, nor with any greater probability : and I should have no fear of excess in employing it. *Murray*, App. II. 177.

Dr. Mead's particular manner of employing it, by joining it with fermenting ale, appears to me frivolous. In short, in many cases in which I gave seen it employed, I have had no evidence of either its diuretic or of its pectoral effects. In common with many other of the *verticillatæ*, it may be employed as an errhine, and in that way cure a head-ache : but no otherways by any specific quality.

HYSOPUS.

This abounds with more essential oil than the foregoing, and has at the same time more of a warm bitter joined with it. It should therefore be a more active medicine ; but how this activity may be best directed, I am quite uncertain. How the essential oils of this, and others of the *verticillatæ*, should be suited to operate particularly upon the vessels of the lungs, I cannot perceive. *Hysop*, however, has always had the reputation of being pectoral ; although in many trials I have not seen its effects. Formerly the distilled water was much employed as a pectoral

in this country, in the cases both of children and adults: but the efficacy of it has been so little observed by our practitioners, that it is now omitted in our dispensatory.

Its effects in resolving coagulated fluids, for reasons given above, I can hardly admit of; but as the vapour of essential oils, externally applied, may excite the action of the blood-vessels, so it is possible that hysop, as well as several other of the verticillatæ, may be usefully employed in contusions and other cases of stagnating fluids. It is possible that like applications may be usefully applied to some contusions of the eyes; but in most instances of the common ophthalmia, I have generally found any warmth applied to the eyes to be hurtful.

The vermifuge qualities of hysop are hardly established by the single instance of its effects which *Van Rosenstein* has given us.

LAVENDULA.

This contains a large portion of essential oil, of a very grateful odour. It is therefore, whether externally applied or given internally, a powerful stimulant to the nervous system; and among the others of this order named Cephalics, the lavender has a very good, and perhaps the best title to it.

It is to me probable, that it will seldom go further than exciting the energy of the brain to a fuller impulse of the nervous power into the nerves of the animal functions, and seldom into those of the vital. It may, however, be with great propriety that Professor *Murray* has dissuaded its use, where there is any danger from a stimulus applied to the sanguiferous system. It is however still probable, that lavender commonly stimulates the nervous system only, and therefore may be more safe in palsy than the warmer aromatics: especially if the lavender be not given in a spirituous menstruum, or along with heating aromatics, which, however, is commonly done in the case of the spiritus lavendulæ compositus.

It is hardly necessary to remark here, what is now so commonly known, that the verticillated plants we are treating of, give out a larger proportion of essential oil, after their being dried for some time, than in their recent state; but it is not so commonly observed, that most of them in their first distillation, give out along with their essential oil a quantity of mucus or butyraceous matter; and that they may be freed from this, and much improved in their fragrance and virtues, by a second distillation with water. It is also to be remarked, that all these plants afford a larger proportion of essential oil, according as they are allowed to grow to their full maturity, and especially as they grow in light, sandy, or gravelly soils.

MARJORANA.

This plant also contains much essential oil of a pleasant odour. From hence it has the same cephalic and discutient qualities with lavender, and which therefore we need not repeat here. We have already observed, that many of the verticillatæ, snuf-

fed up the nose, prove powerful errhines; and in this respect there is none more powerful than the *marjorana*. On this account, therefore, and on account of its agreeable odour, there is none more frequently or more properly employed than this in our sternutatories.

MENTHA SATIVA

Contains much essential oil, but of an odour somewhat less agreeable than that of lavender or *marjorum*. It is therefore less employed as a cephalic: but it acts very powerfully on the parts to which it is immediately applied, and therefore considerably on the stomach, invigorating all its functions. It acts especially as an antispasmodic; and therefore relieves pains and cholic depending on spasm. It will also stop vomiting depending on such a cause; but there are many cases of vomiting, in which it is of no service; and in those cases, anywise depending upon inflammatory irritation in the stomach itself, or in other parts of the body, it aggravates the disease, and increases the vomiting. Practitioners have thought, and I think justly, that the infusion of mint in warm water agrees better with the stomach than the distilled water, which is often somewhat empyreumatic.

The effects of mint in preventing the coagulation of milk, which have been mentioned in authors, do not appear in my experiments: and if it be found useful in resolving indurations in the breast of nurses or of lying-in women, I ascribe it to the discutient virtue of the *verticillatæ*, which we have already mentioned on the subject of hysop.

The ancients have transmitted to us an opinion, that mint has the power of weakening the powers of venery in men, and this has been repeated by some moderns; but it is very inconsistent with the power at the same time ascribed to it, of stimulating the uterus in females. Such an antaphrodisiac power seems improbable to me; because I knew an instance of a man who almost every day eat many leaves of fresh mint with his bread and butter, but never found from these any diminution of his venereal appetites; and I have reason to believe that his report was true.

MENTHA PIPERITA.

This plant contains as much or more essential oil than any other species of mint, and is of a more acrid taste, with a singular feeling of a cold air, immediately succeeding the chewing or swallowing of it. There is no doubt of its answering the purposes of any other species of mint; and the water distilled from it is manifestly more immediately antispasmodic and carminative. The same effects are readily obtained by its oil made into an *Eleo sacharum*, and diffused in water. Its qualities are, with great probability, ascribed to the camphire, which the experiments of *Gaubius* show to be largely contained in it. The rectifications which we have mentioned on the subject of lavender,

as proper for improving the most part of essential oils, is particularly necessary and proper for this of peppermint. What has been called the Essence of Peppermint, seems to me to be no other than the rectified oil dissolved in spirit of wine.

PULEGIIUM.

This is a species of mint, and has so much the common properties of the genus, that, in my opinion, nothing but the neglect of all attempt to establish principles, could have made physicians think of this as a peculiar medicine, different from the other species. It does not contain more essential oil than the *mentha sativa*, and does not discover any of the camphire that is found in the peppermint. It is upon this account that I cannot find any foundation for its peculiar virtues. It has, nevertheless, been considered as an antispasmodic, and of particular use in the chincough: but in many trials of it, I have not found it of any service; and, on the contrary, like every other heating medicine, have found it hurtful.

Another use of it as an antispasmodic has been commonly asserted; which is, its assisting the menstrual evacuations of the female sex: this, however, I believe to be on no better foundation. At the time of menstruation, the sex are often affected with dyspeptic and spasmodic symptoms in the stomach: and I have known these symptoms relieved by an infusion of the pulegium, or, as it is commonly called, penny-royal tea; but the same relief was obtained more certainly by the use of the peppermint, or the *mentha crispa*, though in none of them any specific power can be perceived. They have been often tried in the cases of suppressed menses, without any benefit at all.

It does not appear to me to be with any discernment when *Dr. Haller* tells us, that the pulegium, along with steel, is an infallible emenagogue; as it is presumed that, with the same assistance, he might have found many other plants equally powerful. It is not indeed to be doubted, that the several species of mint may, as general stimulants of the nervous system, be useful in retentions of the menses: but the account given us by *Linnaeus* of mints producing an uterine hæmorrhagy, has probably been owing to a fallacia causæ.

ROSMARINUS.

In this plant there is much essential oil of a very fragrant kind: and it has therefore always justly had the reputation of a cephalic, or as a medicine that gently stimulates the nervous system, but hardly so strongly as to affect the sanguiferous. It is to be remarked here, that these qualities are not to be found in the petals of the flowers, but only in their calices, or in the leaves of the plant especially those to the extremities of the branches. It is indeed further to be remarked here, that the essential oil of the verticillated plants is commonly to be found more copiously in the calices of the flowers than in their other parts. The essential oil of rosemary arises copiously in distillation with spirit:

and it is thus that the celebrated aqua reginæ Hungariæ, or Hungary water, is prepared. It is not made so perfect from rosemary growing in this climate, as in that growing in a more southern. It seems to me that our dispensatories have judged ill in prescribing the spiritus rosmarini and spiritus lavendulæ to be made from recent plants; as all the odorous verticillatæ are improved by some drying, and give out a greater proportion of essential oil.

SALVIA.

This has been a celebrated plant; and as it contains a quantity of essential oil, though not of the most fragrant kind, it may be allowed to have the virtues of the other plants of this order. It has been frequently employed, especially in Britain, as a tea; but it is ridiculous to allege, as some German writers have done, that it may be employed as a tea in place of that brought from China; from which, in its qualities it is entirely different. From particular experience I can assert, that though it has not the virtues, neither has it the noxious qualities, with respect to the stomach, which the green tea of the Chinese so frequently has. What, however, are the particular virtues of sage, I am a little uncertain. Though it were true that the Chinese put a greater value upon sage than upon their own tea, it would not give me an high opinion of its peculiar virtues. It has been observed before, that popular opinions are not always well founded; and in this, and some other instances, the Chinese do not seem to be wiser than other people.

Sage, especially in Britain, has been much employed as a sudorific, but, so far as can be perceived, with no advantage above the other aromatics of the same order. Many of these employed in infusion, and thrown in warm, in pretty large quantity, while the body is covered up very close, will all equally answer the purpose of bringing out sweat. It may however be remarked, that this method has no advantage above others that may be employed; and in some instances have been found hurtful, by stimulating and heating too much.

If sweating is to be employed for preventing the recurrence of the paroxysms of intermittent fevers, sage or other verticillated plants may be sufficiently effectual. But while we thus take notice of the sage as a sudorific, we must observe that it has also been employed for restraining improper sweats. For this purpose *Sydenham* employed Malaga wine: but *Van Swieten* found sage infused in wine or spirits to be a more effectual remedy. Whether the wine or spirits of *Van Swieten* without sage would answer the purpose, as it had done with *Sydenham*, I have not experience to determine. The matter, however, is rendered doubtful; as *Van Swieten* has found the sage useful in restraining another immoderate evacuation. The learned Baron had found it useful in restraining the improper continuance of a flow of milk from the breasts of women who had been nurses, after they had weaned their children; but of this I have not any proper experi-

ence. It would seem, however, to be supported by the analogy with mint, which has been said to have power of diminishing the secretion of milk both in women and in cows.

The power of sage in resisting putrefactions, which it has in common with mint, and other verticillated plants, may perhaps be supposed to be owing to camphire, or somewhat analogous to camphire, in the composition of their oils.

TEUCRIUM.

Several species of this genus have entered the catalogues of the materia medica: but several of them, as having their virtues depending more upon their bitter than upon their essential oil, we have mentioned above among the tonics; such as the *Teucrium Scordium*, *Teucrium Chamædrye*, and *Teucrium Chamæpytis*; and there remains only to be mentioned here among the stimulants, commonly named cephalics, the *Teucrium Marum*. This contains a large portion of essential oil, of a volatile and camphorated kind. By this, its odour is more pungent than most others of the verticillated plants, and has therefore, like many others of this order, an errhine quality, and that the most powerful.

Although this plant has not performed all the wonders which Linnæus reports of it, it may be allowed to be amongst the most powerful cephalic and antispasmodic of the verticillated plants: and it is to be regretted that it can neither be easily cultivated in this country, nor be imported from abroad in a very perfect state.

MARUBIUM.

This is a plant which affords a little essential oil, and that with very little of the fragrance common to the other verticillatæ; for it is more remarkable as a bitter and somewhat acrid substance. It has had the reputation of a pectoral: but in many trials, its virtues in that way have not been observed; and in several cases it has been judged hurtful. For its use in asthma and phthisis, and for its power in resolving indurations of the liver, I consider the authorities of *Forrestus*, *Zacutus Lusitanus*, and *Ghomel*, to be very insufficient; and the events they have ascribed to it seem to be very improbable.

B. UMBELLATÆ.

Here is a set of plants, of which many with their botanical affinity have very similar virtues; but the analogy is not complete, as some of the umbellatæ have virtues very different from others of the same order. It is however alleged, that if the umbellatæ are further distinguished, according to the soil they grow in, an analogy will still hold so far, that those growing in a dry soil are stimulant and somewhat aromatic: whilst those growing in wet and marshy places are sedative and poisonous plants. This is generally true; although there are some exceptions to it. The *conium maculatum*, and perhaps some others of the poisonous umbellatæ, generally grow in very dry soils; whilst the *petroselinum*, naturally growing in wet soils, is a salutary plant.

The analogy therefore from the soil is not complete; and with-

out experiment is not to be entirely trusted. But as it is generally well founded, I shall here make use of it, and in this place treat only of the simple stimulant and somewhat aromatic umbellatæ, reserving the consideration of the sedative kind for their proper place in the next chapter.

AMMI.

These still retain a place in the London dispensatory ; and from the account of their qualities might deserve it : but as an exotic that we cannot easily have in a perfect state, it has been long neglected by us, and perhaps justly ; as probably its place may be supplied by others which we can more easily obtain.

ANETHUM.

I should have remarked before, that the virtues of the umbellatæ are chiefly found in their seeds, as containing a large portion of essential oil. Their virtues are for the most part antispasmodic and carminative in the primæ viæ ; and what virtues they have, when carried further into the system, are not well ascertained ; as we shall observe more particularly when we come to speak of the particular seeds or roots to which these virtues are ascribed.

The seeds of Dill have the common virtues of the order : and the waters distilled from them have been much employed in the colics of children by the nurses of England. But it is presumed that more agreeable carminatives can be found : and accordingly it was formerly omitted in our Scottish dispensatory. It was only brought into it again upon the recommendation of the late *Sir John Pringle*, for the sake of some conformity with the English practice : but neither our physicians nor nurses have yet conformed to it.

ANISUM.

The seeds of this plant contain a large proportion of essential oil, which gives the seeds their grateful odour. Its taste is much less acrid than the oils of the verticillated plants ; some of which, therefore, are perhaps more powerfully carminative : but for the same reason, the oils of the umbellatæ, and particularly, of the anise-seed, are safer, and which made into an *Eleo saccharum*, the most convenient form of exhibiting it, may be given pretty largely.

The anise-seed and their oil, as well as some others of the umbellatæ, have been alleged to be useful as promoting expectoration in some diseases of the breast : but their effects have never appeared to me to be considerable.

Another effect of the anise and other seeds akin to them, has been alleged to be the increase of the milk of nurses ; and if it be commonly true, as alleged by *Mr. Geoffroy*, that the odour appears in the milk, the effect is not improbable ; but I have had no experience of it.

Towards the end of the sixteenth century we had a new me-
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dicine introduced, under the title of the *Anisum Stellatum*; but it has not yet obtained a place in the lists of the British dispensaries, although it has been received by the Russian, Swedish, and Danish. Though of a very different order of plants, the capsules of the seeds, in odour and taste very exactly resemble the common anise, but are somewhat stronger. These capsules, so far as yet tried, as they have the qualities, so they are said to have the virtues of the common anise-seeds: but as even these are not in high request, we shall hardly think of introducing an exotic for the sake of all the difference of strength and quality that may be found in it.

CARUM.

The seeds of this are to most persons more agreeable than those of the *umbellatæ* usually employed. They contain a large proportion of essential oil; and except in some peculiarity of odour, neither the seeds nor their oil differ in their virtues from those of anise.

FOENICULUM.

This has the same qualities as the dill, anise, and caraway, but in a weaker degree; and therefore, unless it be for its odour, which to many persons is more agreeable than that of the others, it would hardly have a place in medicine.

We make a distinction between the *fœniculum dulce* and *fœniculum vulgare*, which, however, are only varieties of the same species; but as the fennel growing in this country does not produce perfect seeds, we mean by the *fœniculum dulce*, seeds imported from a southern climate: we allow, however, the roots to be taken, as they most conveniently may, from the plants growing in our own gardens. To both the seeds and roots a diuretic and pectoral virtue has been ascribed; but in many trials I have never found them to answer these purposes.

CORIANDRUM.

The leaves and seeds of this plant seem to differ very much: the qualities of the former are not so well ascertained as to allow me to say any thing about them, and I am therefore to speak only of the seeds. These have the common qualities of the other carminative seeds we have been speaking of; and when well dried are generally very agreeable. One particular use of them is, that infused along with senna, they more powerfully correct the odour and taste of this than any other aromatic that I have employed; and are, I believe, equally powerful in obviating the griping that senna is very liable to produce.

CUMINUM.

The seeds of this contain a large proportion of essential oil, and are therefore powerful carminatives, perhaps more so than most of the others in use; but on account of their more disagreeable flavour are more rarely employed.

As I formerly observed, that the oils of the verticillated plants might be employed in fomentations for discussing indolent tu-

ours; so it is probable that many of the umbellatæ may be employed for the same purpose, and particularly in this the cummin has been supposed useful.

PETROSELINUM.

The seeds of this still hold a place in the London dispensatory; and have indeed the qualities of the other carminative seeds, but not in so powerful a degree as many others; and therefore are neglected in the Scottish practice.

The roots still retain their place in our dispensatory, and are supposed to be diuretic; but in their decoction, which I have often tried, I have not found such a virtue, and possibly because their active parts are dissipated by boiling.

The herb, as every body knows, is much used at table, and therefore must be supposed to be in general salutary; but singular accounts are given of its effects by materia medica writers: and I dare not contradict them, because I know that in consequence of idiosyncrasy, the effects are very different in different persons. With Professor *Murray* the odour is said to be *ingratus*; with *Bergius* it is *fragrans gratus*. To me both the odour and taste have been always very disagreeable, though now, in my old age, they are much less disagreeable than they were formerly.

PETROSELINUM MACEDONICUM.

This is not retained in the lists of the British dispensatories: and I know of no peculiar virtues to be ascribed to it. But of late there have been reports of its singular powers in some cases of the venereal disease, of which I have had no experience, and must therefore leave to a further time to be properly ascertained.

We have thus mentioned the umbellatæ which are for medicinal virtues chiefly employed in their seeds: and we proceed next to those which are chiefly employed in their root; as,

ANGELICA.

All the parts of this plant are more or less aromatic; but this quality is more considerable in the root than in any other part. It is a root gratefully aromatic; and as possessing all the qualities of the carminative seeds already mentioned, may be employed for the same purpose with these: but that it has any peculiar virtues with respect to any particular disease, I cannot perceive; nor can I trust much to the judgment of the Laplanders on this subject.

PIMPINELLA.

This is a plant in whose favour *Stahl* and his followers were very much prejudiced. In its root and seed it has the common qualities of the umbellatæ already treated of: but these qualities in the pimpinella are in no high degree; and neither its sensible qualities nor any analysis can make us think of it as a medicine of any value. *Dr. Stahl* was valuable for his study of the phenomena of diseases; but neither he nor his followers have shown any judgment in the choice of remedies. Their system

gave them a prejudice against some of the most powerful ; and those they adopted were feeble and often superstitious.

GINSENG.

This perhaps does not belong to the *umbellatæ* ; but from the doubts that have been raised how far it differs from an umbelliferous plant, the *Sion Ninsi*, to which the same virtues have been ascribed, I have set it down here. A root under this name, both from China and North America, has now for many years been well known in our shops. It is a very mild aromatic, with some sweetness : but these qualities are so weak, that nothing but a popular notion among the Chinese, and the great price put upon it by them, would ever have engaged our attention to it as a medicine. We are told that the Chinese consider it as a powerful aphrodisias ; but I have long neglected the authority of popular opinions, and this is one instance that has confirmed my judgment. I have known a gentleman a little advanced in life, who chewed a quantity of this root every day for several years, but who acknowledged that he never found his venereal faculties in the least improved by it.

C. SILIQUOSÆ.

These are a set of medicines which, with a botanical affinity have very exactly the same medical virtues, and are only different by the degree in which they possess the same power. They have a pungent odour depending on an essential oil, which they give out in distillation with water, of the same odour with the entire substance ; and notwithstanding the seeming volatility of it, this oil, like that of the aromatics above mentioned, sinks in water. The pungent odour of these substances has given occasion to the supposition of their containing a volatile alkali : and such indeed, by a certain management, can be obtained from them : but manifestly it is not in a separate state in their substance as they are produced by nature. The distilled water of scurvy-grass does not effervesce with acids, either of the fossil or vegetable kind ; does not precipitate earths dissolved in acids, nor produce any change in the solution of corrosive sublimate.

It is sufficiently evident that both the odour and taste of these plants depend upon the oil above mentioned, which is extracted from them by spirit of wine ; and when carried over with this in distillation, affords a very volatile and acrid substance of the odour and taste of the plant, leaving behind a mass entirely deprived of both.

The acrimony of these plants is diffused over all their parts ; from the leaves it readily passes off by drying or boiling ; from the roots also, if minutely broke down, it may be dissipated by the same means. In their seed it is much longer retained ; and in both the seeds and roots it is more acrid, and in greater proportion than in the other parts of their substance.

The parts of these plants which hold a large portion of active matter, if applied to the skin, soon excite a redness in it : and

in consequence of a continued application, the redness which first appears arises by degrees to a very considerable inflammation, and at length to excite blisters. These continuing for some days after to discharge a quantity of serum, show the skin still affected with an inflammation, which for several days continues to exude an almost purulent substance: and such inflammation and exudation are much later in healing than the like inflammation produced by the application of cantharides.

The same acrid substance of the siliculosæ, taken internally, gives a powerful and diffusible stimulus, which acts strongly on the nervous system; and in larger doses, or frequently repeated, it acts also on the sanguiferous. But its effects in either way are not durable, as the matter passes readily to the urinary passage: and increasing the secretion there, it is quickly and entirely discharged with the urine, and probably at the same time by insensible perspiration.

The plants of this class, when their vegetation, from any cause, ceases, readily run into putrefaction; and in this state, distilled, they give out a volatile alkali.

It is this circumstance that has given occasion to their being called Alkalescent Plants, and has given occasion to some mistakes concerning their nature and use. But we now know that their fermentation may be directed to be of the acescent kind: and there is hardly any doubt, that, with their diuretic quality it is their acescent nature that renders them so powerful, both in obviating and curing the scurvy. Their use in this respect has been long known and universally acknowledged: and it has been remarked as a bountiful administration of nature, that has provided an abundance of these plants especially in those parts of the globe in which the scurvy more especially prevails.

In confirmation of our doctrine concerning the acescency of these plants, it is to be observed, that those species which do not abound in the acrid matter peculiar to the order, but which at the same time are very succulent, that such abound in a saccharine matter, which renders them considerably nourishing, and fitted to become a large part of the animal fluids. It is equally a consequence of this saccharine matter, that the same plants may be readily directed to an acetous fermentation; and when preserved in this state, they prove a very effectual means both of obviating and of curing the scurvy.

These are the general properties of the siliculosæ: and the genera and species comprehended under this order have so much the same qualities already mentioned, that it is hardly necessary to take notice of the particulars. I shall only make some remarks upon a few which are in most frequent use, and seem to be of most considerable power.

COCHLEARIA.

This is the plant that has been most frequently employed in the cure of the scurvy, and has the reputation of being the most

effectual. Its sensible qualities being as great, if not greater than any other of this order, are sufficient vouchers of this. The entire herb has often been employed, and eaten fresh as a sallad; and it has been made into a conserve with three times its weight of sugar; but the virtues are not well preserved in this way. The most common practice is to employ the expressed juice; and this plant makes a chief part of the *succi ad scorbuticos* both of the London and Edinburgh dispensatories, which afford a very useful medicine.

It formerly was an ingredient in the *aqua raphani composita* of the Edinburgh dispensatory; and still stands in that of the London. But the Edinburgh College being of opinion that the whole of its virtues are not extracted by distillation, they have now omitted that disagreeable preparation. Several foreign dispensatories have ordered it to be treated by distillation with spirit of wine; and have thereby obtained a volatile poignant spirit, that may prove an useful stimulus in several cases. It may possibly be improved by a combination with the volatile acid of the tartar, as in the *spiritus antiscorbuticus Drawitzii*, and in this state may be an useful stimulant in paralytic cases. It may also be employed as a diuretic, and in this way also be useful in scurvy; but its antiscorbutic virtues in this state are not to be depended upon, and are far short of the virtues of the plant in substance.

NASTURTIIUM AQUATICUM.

This has the common powers of the *siliquosæ* in a considerable degree; and as more succulent than many others, and to be obtained more early in the spring season, it has been the most frequently employed with the *cochlearia* to give the *succi ad scorbuticos*, which have so long stood in our dispensatories. Along with these, it has been common to join the *becabunga*: but as this has none of the qualities of the *siliquosæ*, and has no other than that of a simple vegetable juice, the Edinburgh College have left it out in the last edition of their dispensatory. It has been always the practice to join with the juices of the *siliquosæ* a quantity of a native acid juice, formerly that of the *acetosa*: and, for the use of the poor, the practice might still be continued with advantage: but the dispensatories have properly enough prescribed the juice of Seville oranges.

The addition of acids to the juice of the *plantæ siliquosæ*, shows sufficiently that the latter do not operate as alkaline or alkalescent substances: and I am persuaded that the addition of acids renders the juice more certainly effectual, by determining them more certainly to an acescent fermentation. It is hardly necessary to observe, that as the volatile parts are so readily exhaled in being exposed to the air, that the *succi ad scorbuticos*, when intended to be preserved for any time, should be kept in close stopped vessels.

CARDAMINI.

The sensible qualities of this plant, and particularly of its

flowers, are so far inferior to those of several others of the siliquosæ, that I should not have thought of taking notice of them as subjects of the materia medica; but upon the respectable authority of *Sir George Baker*. I think it my duty to inform my readers, that the flowers of this plant have been found to be very effectual remedies in various spasmodic affections; and for further information must refer my readers to the *Medical Transactions*, Vol. I. art. 19.

ERYSIMUM.

Several species of this genus have been taken notice of by materia medica writers; but I am to speak only of the *erysimum officinale*, and of this, not for the general qualities of the siliquosæ, which it does not possess in any considerable degree, but for a particular purpose to which it has been especially applied, which is the cure of hoarseness. It is in common to almost all the siliquose plants, that in being swallowed, they stimulate the mucuous glands of the fauces, and thereby excite a more copious excretion of mucus. When hoarseness therefore depends, as it often does, upon the interrupted secretion of this fluid, it is obvious that the stimulus we speak of may be useful. For this purpose, it has been common to employ the *Erysimum*; which, however, has been generally prescribed in an injudicious manner, along with many other things of no meaning; and the most simple form, of merely the juice of the *erysimum*, with an equal part of honey or sugar, is certainly the most proper.

If the *erysimum* in this business has any advantage over the other plants of the order, it seems to me to be its having less acrimony than others, which allows it to be more freely and frequently used. When the *erysimum* was not at hand, I have found that the syrup of horse-radish would supply its place: but this syrup must be made very weak, otherwise it cannot be frequently used or long continued, without rendering the fauces sore and uneasy. I have found that one drachm of the root, fresh, scraped down, was enough for four ounces of boiling water, to be infused in a close vessel for two hours, and made into a syrup with double its weight in sugar. A tea-spoonful or two of this syrup, swallowed leisurely, or at least repeated two or three times, we have found often very suddenly effectual in relieving hoarseness.

BRASSICA.

The various species of this employed in diet I have taken notice of in my first part. The title is repeated here as a medicinal subject; and with this view it is to be observed, that the various species or varieties of this genus differ from almost all the other plants of the order, by their possessing less, at least in their leaves, of the acrimony peculiar to it. By this they are better suited to the purpose of diet; and they are especially fitted to this purpose by their greater succulency, and by their containing, as above observed, a large proportion of saccharine matter.

Though they are deficient of that acrimony that seems to give peculiar power to the siliquosæ, and as they are called Antiscorbutic plants, the brassica has still very great powers as such : and taken in largely as aliments, they have proved an effectual cure of the disease. This I ascribe to their acescency ; and now it is well known, that if by proper art they are made to undergo an acescent fermentation, and can be preserved, in that state, they are a very effectual means, both of obviating and curing scurvy. The art of preparing cabbage for this purpose, and making what is called *Saur Kraut*, is now so well known, and described in so many books, that it is not necessary for me to insert it here.

RAPHANUS RUSTICANUS.

The root of this only is employed ; and it affords one of the most acrid substances of this order, and therefore proves a powerful stimulant, whether externally or internally employed. Externally, it readily inflames the skin, and proves a rubefacient that may be employed with advantage in palsy and rheumatism ; and if its application be longer continued, it brings on a blistering, with the effect I formerly mentioned.

Taken internally, I have said in what manner its stimulant power in the fauces may be managed for the cure of hoarseness. Received into the stomach, it stimulates this, and promotes digestion ; and therefore is properly employed as a condiment with our animal food. If it be infused in water, and a portion of this infusion be taken with a large draught of warm water, it readily proves emetic ; and may either be employed by itself to excite vomiting, or to assist the operation of other emetics.

Infused in wine, and taken into the stomach, it proves stimulant to the nervous system, and is thereby useful in palsy ; and if employed in large quantity, it proves heating to the whole body : and hereby it proves often useful in chronic rheumatism, whether arising from scurvy or other causes. *Bergius* has given us a particular method of exhibiting this root, which is by cutting it down, without bruising, into very small pieces ; and these, if swallowed without chewing, may be taken down in large quantity, to that of a table-spoonful : and the author alleges, that in this way, taken every morning, for a month together, this root has been extremely useful in athritic cases ; which, however, I suppose to have been of the rheumatic kind.

It would seem, that in this manner employed, analogous to the use of the unbruised mustard-seed, it gives out in the stomach its subtle volatile parts, that stimulate considerably without inflaming. The matter of horse-radish, like the same matter of the other siliquose plants, carried into the blood-vessels, passes readily to the kidneys, and proves a powerful diuretic, and is therefore useful in dropsy : and we need not say, that in this manner, by promoting both urine and perspiration, it has been long known as one of the most powerful antiscorbutics.

SINAPIS.

The seeds of this are the part only employed : and it has been common for the purpose of medicine, to distinguish two kinds of it, the *Sinapis Nigra* and the *Sinapis Alba* ; which, though they seem to be of different species, hardly differ in their sensible qualities, and for every person may be indifferently used.

This seed contains a volatile part very pungent to the smell and taste. Treated by distillation with water, it gives out an essential oil which discovers the same acrimony that is found in the whole substance, and shows that the acrimony of this depends upon that. The same substance contains also a portion of mild oil, which may be obtained by expression from the powdered seed, and when this is done, the acrid and active parts are found in the paste that remains after the expression of the mild oil.

In these seeds there is a large portion of farinaceous matter, capable of fermentation, under which the volatile oil is more evolved, and shows its activity more readily : hence it is that the fresh powder shows little pungency, and a good deal of bitterness ; whereas, when it has been moistened with vinegar, and set by for a day, it becomes considerably more acrid, as is well known to those who prepare mustard for the use of the table. This applies also particularly to its external use. Mustard, any how moistened and applied to the skin, will become in time rubefacient and blistering ; but as prepared for the table, is more immediately active than the fresh powder ; and therefore we have done improperly in ordering the fresh powdered mustard in our sinapisms, as the table-mustard would be much more quickly effectual.

Mustard thus applied externally has all the powers of the horse-radish mentioned in the last article ; and I am much surprised that the learned Professor *Murray* should assert, that mustard stimulates the system less than the ordinary vesicatories ; that is, as I suppose, than cantharides : but to me the business seems quite otherwise. Mustard, in its powdered state, taken internally, has all the powers and effects of the other siliquosæ ; but they are here more active and powerful than in almost any other, except it may be the *raphanus rusticus* last treated of.

A practice, so far as I can learn, first begun in this city about fifty years ago, has been since very frequent. It consists in giving the mustard-seed entire and unbruised, to the quantity of half an ounce, or as much as an ordinary table-spoon will contain. This does not prove heating in the stomach ; but stimulates the intestinal canal, and commonly proves laxative, or at least supports the usual daily excretion. It commonly also increases the secretion of urine ; but in this I have found it frequently to fail. In giving it twice a day, as our common practice is, I have not found it to stimulate the system or heat the body. But it must certainly have that effect if it answers in the Swedish practice, by

giving it four or five times a-day to prevent the recurrence of intermittent fevers.

I trust very readily to the testimony of *Bergius*, when he tells us that he has in this way often cured vernal intermittents: and the more readily, when his candour acknowledges that it is not sufficient for curing autumnal quartans. It will be more readily understood, that the bruised seed, taken in large quantity along with some ardent spirits, may not only be more powerful for this purpose; but also, that such doses may stimulate too much; and, as *Van Sweiten* informs us, may induce a violent fever.

Bergius says, that in protracted and frequently recurring intermittent fevers, he had joined powdered mustard with the Peruvian bark with a good effect. He observes, that under this management, his patients had frequently felt a heat at their stomach; but it was without any harm.

I cannot finish this subject without observing two very different opinions with respect to it. Professor *Murray* says, that mustard gives an agreeable sensation in the stomach, and gives in him a cheerfulness to the mind: "*Ita adjuvat cibi concoctionem, ventriculo sensum gratum impertit, mentique certe in memet hilaritatem haud mediocrem, forsitan ex aere fixo quod extricatur, conciliat.*" Linnæus gives a very contrary opinion: "*Nimius usus* (says he) *causatur languorem et tollit lætitiā.*" I cannot vouch for the truth of either opinion.

D. ALLIACEÆ.

The plants to be taken notice of under this title are all of them species of the same genus: and though there are plants of other genera which have the odour peculiar to this, and may perhaps have somewhat of its qualities, they have not so much of it as to deserve being taken notice of here.

Of the species of *allium*, several may be treated of as of very similar virtue: but these virtues are most considerable in the *Allium Sativum* of Linnæus: and therefore we are to treat of this in the first place, under the title of Garlic.

ALLIUM SATIVUM.

The whole of the plant has somewhat of the same qualities; but it is the root only that is employed in medicine. This is of a strong pungent odour, and of a very acrid taste. These qualities depend upon a very volatile part, which is readily dissipated by drying, if the roots be bruised, and the interior parts be exposed to the air, or by boiling in water. This volatile substance is at least in part an essential oil, which may be obtained by distillation in the ordinary manner: and like the oils of many of the *silicosæ*, sinks in water. In all these respects, the *alliaceæ* are similar to the *silicosæ*, as they are also in virtue, although still with some little difference in their chemical qualities.

The *alliaceæ* are not so entirely extracted by spirit of wine as the *silicosæ*; and though the former are in part extracted, they are not carried over with the spirit in distillation as the latter are.

Though the qualities of the alliaceæ are not so readily dissipated by drying as those of the siliquosæ are ; yet they always, by any drying, suffer some diminution of their virtue ; and by urging the drying further, it may be dissipated entirely. In my opinion, *Dr. Lewis* improperly proposes the dried garlic to be used in any proportion as a medicine.

The medicinal qualities of garlic are very considerable ; and I take notice of them first as they are externally applied. Garlic, bruised and applied to the skin, readily inflames it ; and applied for some time will raise a blister, as we have said of mustard and horse-radish. But the effects of the blistering are not so permanent nor so slow in healing from the garlic as from the siliquosæ. It may however be a question, whether the very diffusible nature of the garlic may not in some cases give a more immediate and considerable stimulus to the whole system than the siliquous substances do.

Garlic, taken into the stomach, seems to stimulate this organ and favour digestion, and may therefore be considered as an useful condiment of our food. But both its odour and taste are so disagreeable to many persons, that in many cases they are inadmissible. But as in warm climates it is said to be much milder both in smell and taste, it may in these be more frequently and largely employed.

Even in its most acrid state, it is admitted into many of our sauces in small proportion. Its diffusible odour is very readily and largely communicated to the air of the stomach ; and therefore affects not only the eructations, but even the ordinary exhalations, pretty constantly arising from that organ. It is thereby often disagreeable to the persons who have eaten it, and more so still to bystanders : but all this may be somewhat corrected by some volatile aromatics which have been at the time taken in.

The stimulus of garlic taken into the stomach is readily communicated to the rest of the system, and is certainly heating and inflammatory to the whole. In all cases, therefore, in which a phlogistic diathesis, or other irritability, already prevails, large doses of it may be very hurtful. It is probable, that from instances of its improper use, some authors, imbued themselves with the strongest prejudices against it, have given us too strong assertions of its general baneful qualities : and on the other hand, many, under no such prejudices, have celebrated garlic as one of the most useful medicines.

Its stimulus is more readily and quickly diffused over the system than that of almost any other substance known. It not only affects the perspiration and secretion of urine, but seems to pervade every vessel of the system : and *Bennet's* account of its effects appearing so suddenly in issues is a strong proof of this. By its stimulus being thus diffusible and powerful, it certainly may be useful in many diseases ; as, wherever there is a languor of the circulation in any part, or wherever there are interrupted

secretions. Accordingly, its diaphoretic and diuretic powers have been often useful in dropsy. *Dr. Sydenham* found some dropsies cured by garlic alone.

From what we know of some of the other species of this genus, there can be no doubt of the *allium sativum* being a remedy for the scurvy.

As taken in any manner, and even as externally applied, it so readily appears in the vapour arising from the lungs, there can be no doubt of its promoting the secretions, and therefore the exhalations, from that organ. Its use, therefore, in pituitous asthma, and even in spasmodic asthma requiring expectoration, will be readily admitted: and I am ready to allow what has been asserted, that even in its external application to the soles of the feet, it has been useful in those diseases.

The alexipharmic virtues of garlic have been much celebrated; and so far as diaphoretic and antiseptic powers can prove such, garlic has as good pretensions as many others. Even in the plague, which is so commonly attended with a low fever, it is probable enough that it may have been useful: but the virtues which have been ascribed to it, of obviating and resisting contagion appear to me extremely doubtful.

The stimulant powers of garlic, like those of many other substances already mentioned, may be employed for preventing the recurrence of intermittent fevers; and *Bergius* tells us, that he has seen quartans cured by it. He gives us a particular manner of using it in the following paragraph: “*Incipiendum a bulbulo unico mane et vesperi, sed quotidie unus bulbus super addendus, usquedum 4 vel 5 bulbulos sumserit æger qualibet vice. Si febris tunc evanuit, diminuenda erit dosis: et sufficit postea sumere unicum vel etiam binos bulbulos, mane et vesperi, per plures septimanas.*”

The same author takes notice of a particular virtue of garlic in the cure of deafness: and I am ready to believe it, as I have myself several times found the juice of onion in such cases very useful. *Bergius's* manner of using the garlic it will be proper to give in his own words: “*In surditate rheumatica sæpius levamen attulit, lenam bombycinam succo allii imbibere, illamque auri intrudere, repetitis vicibus per diem unicum. Meatus auditorius inde rubet, dolet et sensibilis fit per diem unum alterumque; tum prurit tandemque; desquamatur, redeunte sæpe auditu.*”

Garlic, as a medicine, is employed in different forms. Sometimes the cloves dipped in oil are swallowed entire; and in this way a number of cloves may be taken at the same time, without proving warm on the stomach, though manifestly acting on the system as diuretic and otherwise. This I take to be the administration of *Bergius* in the cure of intermittents mentioned above. For persons who cannot swallow the entire cloves, they are cut down without bruising into small pieces; and in this way a con-

siderable quantity, if swallowed without being chewed, may be taken at once, and without proving very warm in the stomach, although it is found to be an active medicine. When the garlic cannot, in any of these ways, be taken in a somewhat entire state, it is to be bruised; and, with powders coinciding with the intention of the garlic, the whole is made into pills: but it is not a very proper formula for long keeping, as the active parts of the garlic are readily dissipated by drying. These active parts are more certainly preserved by infusing the bruised garlic in warm water, and after a due infusion making the liquor into a syrup of oxymel, in the manner of the London dispensatory. In this form the garlic is considerably powerful; but cannot be taken in any considerable quantity, without irritating the fauces, and even the stomach: and in any quantity, in which I could introduce those forms of the medicine, I have been often disappointed of its diuretic effects.

ALLIUM SCORODO PRASUM.

This is the species which in its acrimony comes nearest to the *allium sativum*; but I do not know of its being used as a medicine, though it might perhaps be conveniently done, as the bulbs in the flower heads might be swallowed more easily than the cloves of the *allium sativum*.

ALLIUM CEPA.

This contains a very volatile part, which, however, flies off so readily upon the substance being cut into and exposed to the air, that it cannot be directed to any medical purpose. What remains, when this is dissipated, has both in smell and taste a great deal of the acrimony of the garlic: but both in so much a milder degree, that though there can be no doubt of its stimulating the stomach so much as to prove an useful condiment to our food, and though it certainly passes both by perspiration and urine, and therefore may be useful, yet it does not seem possible to find in it an active remedy. Besides the acrid matter peculiar to the genus, it contains also a saccharine and mucilaginous substance: which is a nutritious matter, and may in the whole of its substance be employed as a useful antiscorbutic. All the species of *allium* have been by many writers commended as useful in nephritic and calculous cases: but they do not seem to act otherwise than as diuretics; the use of which, in nephritic and calculous cases, is in general very doubtful. It does not seem necessary to mention the use of onions externally applied in promoting suppuration; for as they are employed in a heated state, they do not seem to have more power than that of other mucilaginous poultices. The use of their juice in the cure of deafness, by a few drops put into the ear at bed-time, I have mentioned above on the subject of the *allium sativum*.

Some other species of *allium*, as the *allium porrum*, *allium ascalonicum*, *allium fistulosum*, and *allium schænoprasum*, are employed in diet, but hardly in medicine; as their qualities are

in a less considerable degree than those we have already mentioned. In diet, the *allium porrum* affords a large quantity of nutritious matter: and the *ascalonicum* is conveniently employed as an agreeable condiment, having much less of the odour that is disagreeable in the *allium sativum*, or even in the *cepa*.

E. CONIFERÆ.

Of this order only two genera, the *pinus* and the *juniperus*, are to be taken notice of here; for though there are many other plants that belong to this as a natural order, there are many of them of very different qualities from those we are to treat of; or if some of them have somewhat of the same qualities, they have them not in such a degree as to entitle them to have a place in the *materia medica* of Europe.

PINUS.

This genus comprehends a great number of species very much of the same qualities; but in what different degrees I cannot exactly determine, and I do think it necessary to attempt it; for it appears to me that the virtues of all of them depend upon the *Turpentine* they contain: and it is properly the virtues of this well-known substance which we are to treat of here.

This indeed again has been considered as of different species; and it may be allowed that they are different in the degree in which they possess the general qualities; but I doubt much if this difference is in any case so considerable as to affect the purposes of medicine; and I am of opinion that the Edinburgh college have done rightly in taking into the list of their *materia medica* the *terebinthina larigna*, or, as it is commonly called, the *Veneta*, only. And as this is the only kind that has been the subject of my observation, it is this only I am to be understood more strictly to speak of here: but I hope, that what I am to say will apply to all the other species which have been or may be in use.

Turpentine in its entire state is an acrid substance; and when applied to the skin, inflames it to a considerable degree. It might perhaps by itself be an useful rubefacient, but when we would prevent its operation from going too far, it is not easy to wash it off the skin. When it was employed in the *emphlastrum volatile* of the former edition of the Edinburgh dispensatory, it proved a very powerful rubefacient, more powerful than that of the volatile alkali combined with expressed oils.

The only difficulty I have found in the employment of *turpentine* in this form was, that it often gave more pain than my patients would willingly bear; and that it was necessary to take it away before it had the effects in removing the pains of the joints for which it had been applied.

From this account of the acrimony of *turpentine*, it will readily appear that it was, if ever, improperly applied for fresh wounds; and whatever has been said in this respect by former writers, of the power of this or of other substances under the name of balsams, very much of the same nature, must have

proceeded upon mistake. It is true, when wounds or ulcers, from a flaccidity of the parts, do not come to a proper suppuration, the stimulus of turpentine may be of use ; but even in that case the turpentine or balsams of the same nature cannot be properly employed alone, but must be diffused and involved in some substance that may moderate their acrimony, as in the digestive so commonly employed by our surgeons.

I take it to be an improvement in modern surgery, that to fresh wounds, and even to them in their suppurating state, no applications but of the mildest kind are to be made ; and that the application of terebinthinated substances are not only unnecessary but may be hurtful.

These are the observations I can make on the external use of turpentine ; but its internal use has been also very frequent. Upon account of its disagreeable acrimony in the mouth and fauces, it cannot be easily taken by itself into the stomach ; but must be accompanied with some other matter, as sugar, honey, or yolk of egg, so employed as to soften its acrimony, and serve to diffuse it in a liquid ; or it may, by means of a powder, be brought into the form of pills. But however softened or exhibited, it is ready in any large quantity to be warm in the stomach ; and to give that uneasiness or sickness which, as we judge, arises from substances not readily miscible with the animal fluids.

There can be no doubt of its stimulating the stomach, and communicating from thence a stimulus to the whole system : but its peculiar effects in this way I have not had occasion to discern.

As it proceeds farther in the alimentary canal, it manifestly stimulates this, and proves more or less a laxative, though it can hardly be taken in, in such quantity as to prove remarkably purgative. Its power, however, of stimulating the intestines, appears especially when it is employed in glysters : when, to the quantity of half an ounce or an ounce it is very diligently triturated with yolk of egg, so as to be perfectly diffused and suspended in a watery liquor, and in this state injected into the rectum ; we have found it to be one of the most certain laxatives that could be employed in colics and other cases of obstinate costiveness.

When it is carried into the blood-vessels, it there shows its power of stimulating the whole system ; and as such it has been found useful in chronic rheumatism, and like some other terebinthinate stimulants, has been found useful in preventing the gout. It shows constantly a tendency to pass off by the secretion of urine, which it imbues with a peculiar odour, and proves very generally diuretic. At the same time it cannot be doubted that it passes by perspiration : and these operations explain very well why it has often been found useful in the scurvy.

As it may be readily admitted, that the same medicines which pass by perspiration through the skin will also pass by the exhalation from the lungs. This will in some measure explain the virtues that have been ascribed to the terebinthinate substances, which

come under the title of balsams, in some diseases of the breast. —Here, however, is the place to remark, that even from a mistake, as I judge, with respect to the use of turpentine in wounds and ulcers, and more certainly from a false analogy, the use of it has been transferred to internal ulcers of all kinds. It is, however, now very generally understood, that terebinthinate medicines are not only useless but commonly very noxious in such cases. This was first pointed out by *Dr. Boerhaave*, and after him, without however his being taken notice of, has been since inculcated by *Dr. Fothergil*. After both, the argument that may be employed is, that such internal ulcerations are so far from needing the inflammatory stimulus, by which the balsams are often useful in external ulcers, that it is a state of too much inflammation that prevents their spontaneous healing.

With respect to the internal use of turpentine, it is proper to remark, that as a diuretic, it has been commended for preventing calculous concretions in the urinary passages, and for carrying off such concretions, whilst they are in a condition to pass by the excretories: but from any thing we yet know of the lithogenesis of the human body, we cannot perceive a foundation for the first opinion; and with respect to the second, the applying such a stimulus is always in danger of being hurtful, and commonly proves so.

Another operation of turpentine in the urinary passages is that in the case of gleet. The pathology of these, however, in different cases, is not yet so well ascertained as to teach me to adapt a proper remedy to each: but there is a case in which I have found the disease cured by inducing some degree of inflammation upon the urethra; and I am persuaded that turpentine, or what is much the same, the balsam copaivæ, operates only in this manner; for I have had some instances both of turpentine and of balsam copaivæ producing a manifest inflammation in the urethra to the degree of occasioning a suppression of urine; but at the same time, when these effects went off, a gleet which had subsisted for some time before was entirely cured.

It appears to have been the analogy with gleet that has led practitioners to employ the terebinthinate medicines in the fluor albus of females; a disease difficult both with respect to theory and practice. Physicians have recommended the use of these medicines in the fluor albus: and I have frequently employed them, but seldom with success; and one hindrance of this has been, that few female stomachs can be brought to bear the quantities of the medicine that might be necessary.

It is time now to observe, that the whole of the virtues of turpentine we have mentioned, depend especially, if not entirely, upon an essential oil: which by distillation with water may be obtained from it in large quantity, and which is often used as a medicine in its separate state. Externally applied, this oil irritates and excites some degree of inflammation in the skin, but

not so readily or so considerably as the entire turpentine. It is, however, an useful rubefacient, and seems to be as effectual as any of the aromatic oils: and if it was not for its disagreeable odour, it would be more frequently employed than these along with camphire, or otherwise.

Its stimulant power, externally applied, appears sufficiently from hence, that anointed on the spine it has been found useful in intermittent fevers.

Taken into the stomach, it excites a sense of heat, and an uneasiness of the same kind as that arising from the entire turpentine, and it is equally indigestible. Carried further into the intestines, it does not discover the same laxative quality as the entire turpentine.

It passes readily into the blood-vessels: and there it is commonly determined to the urinary passages, and increases the secretion of urine; but as it cannot be easily introduced in large quantity, I have never found it a very useful diuretic, and not always a safe one, as sometimes irritating the urinary passages too much; and of which we have two remarkable instances from *Dr. Steedman* in the *Edinburgh Medical Essays*, Vol. II. art. 5.

It seems to be a very diffusible stimulus, and probably pervades the whole system. It seems to irritate the extremities of the vessels every where; and the use of it which the *Drs. Pitcairn* and *Cheyne* have proposed in the sciatica, is very probable. I have never indeed found any person's stomach to bear it in the quantity they have proposed: and therefore I perhaps have been disappointed of its effects in the entire cure of the disease: but even in lesser doses I have frequently found it an useful remedy.

As the *pix liquida*, or tar, is a matter that, by a particular mode of burning well known, is procured from various trees of the pine kind, it falls to be mentioned here. It is properly an empyreumatic oil of turpentine, and not only retains much of the stimulant power of that, but perhaps possesses also some others acquired by the burning; so that it has been supposed to have powers analogous to those of turpentine. It is, however, a substance more disagreeable than the turpentine or its oil; and in several trials of the *pilulæ piceæ* of the *Pharmacopœia Pauperum*, I never found them of any special use.

A mixture of equal parts of tar and mutton-suet, or of five parts of tar to two of wax, forms an ointment which some have thought of use in certain ulcerations: but I have never found that in any case it answered better than ointments with a more moderate impregnation of turpentine: and the tar ointment applied, as some have proposed, to cancerous sores, has always appeared to me to be hurtfully irritating.

I have met with an empirical practice with respect to tar of a singular kind. A leg of mutton is laid to roast; and whilst it continues roasting, it is basted with tar instead of butter. Whilst

the roasting goes on, a sharp skewer is frequently thrust into the substance of the mutton, to give occasion to the running out of gravy; and with the mixture of tar and gravy to be found in the dripping pan, the body is to be anointed all over for three or four nights successively; whilst for the same time the same body linen is to be worn. This is alleged to be a remedy in several cases of lepra; and I have had one instance of its being employed in a *Lepra ichthyosis* with great success: but for reasons readily to be apprehended, I have not had opportunities of repeating the practice.

When treating of tar, it might be expected that I should treat of tar water: but I refer that to another head, under which the virtues of this liquid will be more properly considered.

The virtues ascribed to tar, of obviating and correcting the contagion of the small-pox do not deserve any notice. *Wallerius* followed the practice of the vulgar in this affair, and thought it was attended with success. But he is so candid as to say, that whether the effects were to be ascribed to the use of the tar, or to other causes, he could not determine.

In the whole of the above, I have considered the properties of turpentine as in common to the whole of the turpentine affording by the genus of pines: and I have not thought it necessary to take notice of the various species marked by materia medica writers, as proceeding from different kind of pines, or of those from plants or other genera; as I have supposed the terebinthina *larigna* to be possessed of every virtue necessary for the purposes of medicine. In all this, however, I may perhaps have gone too far: and I must own, that some of the other turpentine are more grateful in their odour and milder in their taste; and such in particular is the *Balsamum Canadense*: but after all the attention I have been able to bestow, I have not perceived that it has any peculiar virtues, or in general more power to entitle it to the singular esteem that many seem to have conceived for it.

JUNIPERUS.

This is the other genus of the conferræ we are to take notice of: and it is very properly connected with the former, both by its botanical affinity and by its similar virtues. It contains, minutely diffused through its whole substance, an essential oil very much the same with that of turpentine, only of a more agreeable odour. It is manifestly diuretic, and imbues the urine with the same violet smell that the turpentine do.

Whoever attentively considers the writers on the materia medica, will, I think, perceive, that all the virtues ascribed to the different parts of the juniper may be referred to the essential oil I have mentioned: and I must observe, that I have not found it a more powerful diuretic than the oil of turpentine; and though it be of a somewhat more agreeable odour, I have hardly found the stomach receive it in larger quantity than the other.

The part of juniper chiefly employed in medicine is the ber-

ry; which, especially as produced in somewhat warmer climates than ours, contains, diffused over their whole substance, particularly in their seeds, the essential oil I have mentioned in larger quantity. In the common employment of juniper-berries, unless pains are taken, by a strong contusion, to break these seeds, the infusion is an agreeable, but a weak impregnation; and therefore of very little power as a medicine.

When spirit of wine is applied to these seeds, it extracts the essential oil from the husk, pulp, and bruised seeds very entirely, and carries them over with it in distillation. By this it proves a diuretic, but to my observation never a very powerful one; and when largely used, proves more hurtful by the menstruum than useful by the diuretic quality of the impregnation. To many persons, especially after the repeated use of it, the proper odour of the juniper berries is sufficiently agreeable; but to others it must be rendered so by the addition of some other aromatics, as in the aqua juniperi composita.

If juniper berries are treated by decoction in water, as happens to them in distillation, and the decoction is afterwards inspissated to the consistence of an abstract, it gives what is commonly called the Rob Juniperi. As in the preparation of this, it is commonly directed to avoid bruising the seeds, so a little only of the essential oil is extracted; and what is extracted is almost entirely dissipated by the boiling. I have always judged this to be an inert preparation. It is sweetish, and very slightly aromatic: but I have never found in it the virtues which *Hoffman* and others have largely ascribed to it.

I might here mention the Sandaracha and Olimbinum as products of the juniper: but as I cannot ascribe to them any medicinal virtues, I do not think it necessary to take any notice of them.

JUNIPERUS SABINA.

This we have already mentioned under the title of the Fœtids; and shall say more of it under the title of Emmenagogues.

F. BALSAMICA.

After the consideration of turpentine, I set down this title, because almost the whole of the substances called Balsams, have the form and consistence of turpentine; and seem to consist of this for the greater part of their substance. Accordingly, I think they are of very similar virtues; or how far these, in the different species, are different, I find it difficult to ascertain.

BALSAMUM COPAIVÆ.

This is of a thinner consistence than the Venice turpentine; and plainly for this reason, that it contains a greater proportion of essential oil, which it affords by distillation with water. Its virtues, whatever they are, depend upon this essential oil; for when this is drawn off by distillation, the resinous substance remaining is without smell or taste. The oil separated has not been employed as a medicine; but I dare say it may, like oil of turpen-

tine, be employed as Hoffman proposes, with a double quantity of hog's lard, in paralytic cases.

The entire balsam has been pretty much employed; but the virtues of it, like those of the other balsams, have been very much mistaken. A certain writer has treated professedly of this balsam, but very differently from other monographers; he very candidly points out the mischievous consequences of its large use; and as it applies to the other balsams as well as this, I *judge* it will be for the instruction of students, if I shall here transcribe what Dr. *Hope* has said upon the subject.

After giving an account of the virtues commonly ascribed to this balsam, he gives the following paragraph.

“Hæc autem omnia in recensitis affectibus præsat sub divina benedictione Balsamum Copayva, si genuinum nolloque mango-nio corruptum vel infractum, debito tempore et modo, justaque quantitate a prudenti medico et exercitato chirurgo adhibetur: largiori enim dosi, vel longiori, quam par est, minusve opportuno tempore assumtum sulphure suo balsamico et acri sensiles tunicas primarum viarum extimulat; humores nimis exagitat; et sic febres, hæmorrhagias, cephalalgias, cordis palpitationes, dolores, et ardores ventris, aliaque incommodo parit. In specie phthisi et ulcere renum laborantibus abusus balsami Brasiliensis facile tussim exasperat; hæmoptoⁿ et mictum cruentum infert; febre^mque lentam intendit. Nephriticis quoque frequentius et largius exhibitum dolores et inflammationes renum adauget. Dysenteria maligna et lienteria notho, quæ ex denudatione tunicæ nervæventriculi ac intestinorum oritur, vexatis balsamum nostrum propinatum, vel clysmatibus additum sæpe ardores internos excitasse observavi. In omnibus igitur alvi fluoribus, ab humorum in primis viis collectorum acrimonia natis, et cum gravi intestinorum inflammatione junctis, balsamum Copayva assumtum plus obest, quam prodest. In mictu cruento et dysuria senum, ab humorum salsedine producta, similiter nocet; quia sanguinem nimis commovet, et vias urinarias, jam dolorifice affectas, magis irritat. Nec etiam extus adhitum balsamum Brasiliense semper et ubi-vis conducit; quia vulneribus et ulceribus nondum satis deteris, seu a pure inhærente liberatis, admotum intempestive cicatricem inducit: et sic ulcera sæpe numero sinuosa infert, quæ brevi tempore recrudescunt et difficilius sanantur.” Ex *Dissertatione, D. Frid. Wilh. Hoppe*, apud Valentini Indiam literatam, p. 624.

In late times, the chief use of the balsam copaivæ has been in the case of gleans; and of this I have spoken sufficiently above on the subject of turpentine. I have been frequently disappointed of its effects, perhaps from my mistaking the nature of the case; but I believe frequently from its being taken in too small quantity, the patient's stomach often refusing to admit of a larger. I have sometimes had success with it; but have frequently found it too irritating and very hurtful. Wherever I could suspect ulceration in the urinary passages, there it was especially hurtful.

With respect to its use in the fluor albus, I have nothing to add to what I have said above.

As I have observed above, that turpentine, in acting upon the intestines, proves laxative; so the same has been observed, and I have myself observed it, of balsam copaivæ. Whether a certain effect of balsam copaivæ is to be imputed to this operation, I cannot determine; but must observe what I have learned from an empirical practitioner, that it gives relief in hæmorrhoidal affections: and I have frequently employed it with success: for this purpose, it is to be given from twenty to forty drops, properly mixed with powdered sugar, once or twice a-day.

BALSAMUM PERUVIANUM.

This is a terebinthinate substance, and procured from a tree that is a species of the terebinthus. It is of a stronger flavour, and of more acrimony than most others: but what peculiar virtues arise from hence is not well ascertained. It was formerly much celebrated for the same virtues as the other balsams; but at present it is little used in our practice, possibly from our seldom having it in its genuine state.

The singular power in wounds of the nerves, ascribed to it by *Van Swieten*, is not confirmed by the experience of our surgeons; who trust more to cutting through the nerve, to emollient applications, and to obviating the effects of the irritation by the internal use of opium, than to any balsam poured into the wound.

We may readily admit of the virtue ascribed to it by *Sydenham*, of curing the colica pictonum, as its laxative qualities are analogous to what we know of turpentine and balsam copaivæ.

The warm commendations bestowed by *Dr. Hoffman* upon the tincture of it in spirit of wine, I have not attempted to examine by experience: but they appear to be no other than that of a general stimulant power, which possibly we can obtain from many other substances.

BALSAMUM TOLUTANUM.

This, with a very agreeable flavour, is in taste the mildest of all the balsams. It has been celebrated for the same pectoral virtues as the others; and we can only say, that from its mildness, it may be the most innocent.

BENZOINUM.

The place of this here is not the same that it holds in my catalogue: but I set it down here on my supposing a certain relation of it to the immediately foregoing balsams. The benzoin is a singular composition of an acid salt with an oily and resinous substance: but as a saline matter of the same kind is found in most of the turpentine and balsams, it may be supposed that there is an affinity between this and all the balsams we have been mentioning.

It appears to me, that the benzoin affords an analogy for explaining the composition of all these; though chemistry is yet far from being able to explain the various combinations which

nature makes in vegetables. For the chemical history of benzoin, I must refer to several late writers who have treated of it; but I take no notice of them, as they have thrown no light on its use in medicine.

The flowers, which is the only preparation employed, are manifestly a saline substance of the acid kind, of considerable acrimony and stimulant power, as I have found in every trial of them I have made. It has been recommended as a pectoral; and I have employed it in some asthmatic cases without finding it of use; and in a dose of half a drachm it appeared to be heating and hurtful.

STYRAX CALAMITA.

I subjoin this substance here, as it contains, though in less proportion, the same essential salt as the benzoin; and therefore may be supposed of the same nature and virtue.—What these virtues are, is not at all ascertained; and it is so little employed in our practice, that I have had no opportunity of judging of them from experience.

STYRAX LIQUIDA.

The origin of this is not well ascertained; and therefore we have no analogy for ascertaining the nature of it, but from the name of *Styrax*, commonly applied to it. On account of the name I have set it down here; and for this further reason, that the odour of it somewhat approaches to that of the *styrax calamita*. In its consistence, and by the acrimony of its taste, it greatly resembles these.

Hitherto it has been almost only employed for external use; and in that, to what particular purpose it is adapted is not well determined: but very lately I have been informed, from an empirical practice, that, mixed with some unctuous substances in the proportion of one part of *styrax* to two of *ung. basilicon nigrum*, it has been of remarkable service in paralytic cases, and particularly in a debility of the limbs following rickets.

G. RESINOSA.

MYRRHA.

I begin with this, that I may not separate substances which should be considered together.

This is a gummy resin, which has long been considered as a valuable medicine; and seems entitled to some esteem by its sensible qualities, and by the acrid matter that a chemical examination shows it to contain.

Its proper virtues, however, seem to me to have been mistaken. It manifestly stimulates the stomach, and, when taken in moderate quantity, promotes appetite and digestion: but taken in larger quantities, as in half a drachm or two scruples for a dose, it raises a disagreeable sensation of heat in the stomach, and at the same time occasions a frequency of pulse and a sense of heat over the whole body. From this power, it may sometimes be useful in that flaccidity of the system which is so often connected

with a retention of the menses: but we cannot perceive that it has any peculiar power of determining to the uterine vessels, and therefore that it has not any title to be supposed, as it has usually been, an emmenagogue. By its sensible qualities, it has not even so much pretension to that as the fetid gums.

Another virtue ascribed to myrrh by several writers, and of late recommended in England, is that of a pectoral, and proposed to be employed even in phthisical and hectic cases. From my constant and frequently repeated observation of the heating qualities of myrrh, I cannot readily admit of such a measure; and upon several trials, I have found no benefit from the use of it, and often manifestly harm from it, when it was either given largely or frequently repeated. I am pleased with the discretion of Cartheuser; who, though extravagant in the commendation of myrrh, has this passage: “*Blande attenuat, et imminentes fluidorum non minus quam solidorum corruptionem avertit, vel jam præsentem, febre lenta, tamen aut hectica nondum stipatam, efficacissime corrigit.*”

The myrrh has been much employed externally in ulcers of various kinds, and has been much celebrated for what are called the balsamic and antiseptic virtues. There is indeed no doubt of its possessing the virtues of the balsams: but its acrimony is perhaps greater than in any of these, and the whole of its virtues are now almost entirely denied by the present practitioners of surgery.

If the virtues of myrrh are to be employed, they may be extracted either by water or spirit of wine; and, for most purposes, properly enough by a proof-spirit. The extracts by spirit of wine are more acrid; those by water more mild.

If its stimulant qualities are especially required, *Dr. Stahl* is right in alleging that the quantity of myrrh in the spiritous tincture will go as far as twice that quantity of the myrrh in substance. But if the opinion of the most part of physicians be to be followed, that the myrrh is most safely employed in a milder state, the extraction by water will best answer the purpose: and it has been speciously proposed, that the myrrh in substance should be given to be chewed in the mouth, and no part of it swallowed down but what is dissolved in the saliva.

LADANUM.

This stands next in my catalogue. But I think it might have been omitted altogether; as it is never now employed internally as a medicine for any purpose whatever. It is retained indeed in the shops, and enters into some external compositions; but it seems to be rather for its grateful odour than for any specific virtue.

GUAIACUM.

This medicine was first brought into use for the cure of the venereal disease, soon after that disease appeared in Europe. For some time after that period, it continued to be the remedy chief-

ly employed: and it is impossible to reject the testimonies given then, and frequently since, of the cures performed by it alone. There are, however, also many testimonies of its inefficacy: and as soon as the use and proper administration of mercury came to be known, the efficacy of this was found to be so considerable and certain, that it soon came to be the remedy generally employed, and at the same time the guaiacum came to be generally neglected.

Some indeed have since, particularly *Dr. Boerhaave*, entertained a favourable opinion of its use in venereal cases, under a proper administration; and *Astruc* has given a particular opinion, that it is especially suited to syphilis combined with scrophula. I have had no opportunity of examining this later opinion by experiment: and with respect to its use in syphilis, I have not of late met with any instance in which the guaiacum alone was employed: nor do I know of any practitioners in Europe who now trust to it alone, or who have had success with it.

We are therefore to say no more of the use of guaiacum in the venereal disease; but it has been celebrated for many other virtues. By many the continued use of the decoction has been commended for the cure of cutaneous ailments; and in some of these it has been sometimes successful: but as I find it difficult to distinguish the various species of these, I dare not absolutely deny its power in this respect: but I can assert, that in many trials I have not perceived its efficacy in any.—For the effects of gum guaiacum applied externally to cutaneous sores, see *Hunter* on the Venereal Disease.

In cases of chronic rheumatism, its virtues are more certainly established, and the employment of its decoction has been sometimes successful: but both because the exhibition of large quantities of it is to most persons disagreeable, and because its resinous parts, in which its virtue chiefly resides, are not well extracted by water, the use of the decoction is very much laid aside: and even the extracts which have been proposed to be made from it are hardly in use. It is the resin that spontaneously flows from it, in the countries in which it is produced, that is now chiefly employed in rheumatic and gouty cases.

We have this medicine imported under the title of Gum Guaiacum; which is a substance containing a large proportion of resin, and, as some say, to three fourths of its whole substance. Though I am persuaded that the virtues of this gum depend very entirely upon its resinous part, we can hardly think it necessary to extract this resin by itself, as, for most purposes, spirituous menstrua extract it sufficiently from the gum: and if an aqueous solution, which we judge to be often necessary, is to be employed, the gummy part favours the more ready diffusion of the resinous; and it seems therefore best in every case to employ the entire gum. The resinous part seems to be very analogous to the nature of the balsams and turpentine above mentioned; and therefore it may be supposed, like these, to be very diffusible in

the system, and thereby to have a considerable power in stimulating the extreme vessels every where. It is indeed this which seems particularly to account for its power in chronic rheumatism.

As there can be no doubt of its passing off by the pores of the skin, it will therefore appear to be a probable remedy in some cutaneous disorders. For these and other purposes it has been administered in different forms. It has been extracted by spirit of wine; and this strongly impregnated with it, gives the balsamum guaiacinum of the London, and the elixir guaiacinum of the Edinburgh dispensatories. Both of them with little addition of virtue, are flavoured by a portion of balsam of Peru. These preparations are extractions of the pure resinous part; and whether it be with any advantage, either with respect to virtue, or to more convenient exhibitions, we are very doubtful.

Both colleges have also ordered the guaiacum to be extracted by the spiritus salis ammoniaci vinosus, which is a combination of spirit of wine with the caustic volatile alkali; for though a mild alkali is prescribed, it is truly the caustic only that can be combined with spirit of wine. This menstruum extracts the guaiacum very largely; and it is accordingly very much employed; but whether it gives much advantage to it seems to be uncertain. We are of opinion, that it often limits the dose that might be otherwise given: and as in many cases, the guaiacum is too heating, so this form of it must be especially such. And a solution of the gum in strong rum or brandy may be given more free and safely, and if I mistake not has been given with equally good effects.

This leads me to speak of the great fame which guaiacum has lately acquired in the cure of the gout. The guaiacum had been well esteemed in England, both by *Mead* and *Pringle*, for the cure of rheumatism; but its being a cure for the gout was first discovered by *Mr. Emerigon* of Martinico; who at first from his own experience, asserted its power and success in delivering entirely from the pains of the gout. This he soon after communicated to Europe, and the fame of it soon spread over the whole; and since that time there have been many in every country of Europe who have employed this remedy.

It consists of two ounces of gum guaiacum infused in three pounds avoirdupoise of good rum; and after digesting for eight days, the tincture is poured off through paper, and the patient takes a table-spoonful of this every morning for a twelvemonth or more. The reports of the trials made, from different countries, have been very various. Many persons have boasted of its success: but there are many also who complain of being disappointed in their expectations. Several complain of being hurt by it; and it appears that the adapting it properly to cases and constitutions is not yet well ascertained. It has been alleged by the patrons of it, that it may be given even when a fit of the gout

is present; but I am certain from several instances, that this is a very hurtful practice. For my own part, I have known several who have taken it with the effect of putting off their fits of the gout for a long time, but none in whom they did not return. In one instance a person liable to annual fits of the gout, had none for two years; but became by degrees, affected with a hydrothorax, of which he died: and I suspect that several others who have taken the tincture of guaiacum have undergone the same fate; for, from the experience of the Portland powder and other remedies, I am persuaded there can hardly be found a means of preventing inflammatory fits of the gout without inducing an atonic and dangerous state of the system.

Several physicians have apprehended mischief from the use of the guaiacum in a spirituous tincture; and I am certain that it sometimes happens. It is therefore, that in imitation of the very respectable *Berger* of Copenhagen, I avoid the spirituous tincture of guaiacum, and employ almost only the diffusion of it in water. In preparing this, having first, with an equal part of hard sugar, reduced the guaiacum, to a fine powder, I apply some portion of the yolk of egg, or of a mucilage of gum arabic; and rubbing these together very carefully, I form an emulsion with water or watery liquors, as may be thought proper. This preparation I give over night, in such a quantity as may open the belly once next day; which will happen to different persons from doses containing from fifteen to thirty grains of the guaiacum. In imitation of the late Sir John Pringle, I use this preparation for some time together in chronic rheumatism: but I never employ it for a great length of time with a view to prevent fits of the gout; as I would, for the reasons given above, think this a dangerous practice; but when disorders of the stomach, or wandering pains in other parts of the body can be imputed to atonic or retrocedent gout, I have frequently employed it, and as I judge, with great advantage.

SARSAPARILLA.

This is set down here because it so frequently accompanies the guaiacum in practice: but if I was to consult my own experience alone, I should not give this root a place in the materia medica: for, tried in every shape, I have never found it an effectual medicine in syphilis or any other disease. Other physicians, however, have had a better opinion of it, and have communicated this to the public; which I leave my readers to consult, and to follow their opinions if they shall think proper.

SASSAFRAS.

This is a wood whose sensible qualities are more considerable: and as it contains a large portion of a very acrid essential oil, it may be presumed to have virtues; but what these are, I have not been able to ascertain. I must indeed acknowledge, that I have never employed it with any constancy, or in large quantity, in any disease: nor do I know that such use of it has been attempted in modern practice.

It is commonly extracted by infusion only, and the long decoction of it is commonly avoided. But this practice is not very well founded; as the decoction is found impregnated with active parts. This wood is said to be diaphoretic, and I believe justly; for I have found that a watery infusion of it taken warm and pretty largely, was very effectual in promoting sweat; but to what particular purpose this sweating was applicable, I have not been able to determine.

SANTALUM CITRINUM.

This still holds a place in our dispensatory lists: and by the essential oil and resin it contains, it may certainly be an active medicine. But though *Dr. Hoffman* has been a little extravagant in its praises, his authority has not been sufficient to have it retained in present practice. It may perhaps be neglected, as we have probably in our hands many other medicines of equal virtue.

H. AROMATA.

After treating of the verticillatæ and umbellatæ, as stimulants, having this quality from the essential oil abounding in them, for the most part of a grateful odour, I have here put down those substances, which, though not connected by any botanical affinity, have their virtues very manifestly depending upon their essential oil, generally of the most grateful odour, and from which the idea of aromatic has been chiefly taken.

These aromatics are almost all of them the produce of very warm climates: and their oils have generally the property of sinking in water. They are all of them considerably acrid and inflaming when applied to the skin; and when given internally, they stimulate the stomach so much as to show very strongly antispasmodic and carminative virtues.—At the same time they stimulate the energy of the brain so much as to affect the heart and sanguiferous system; and are therefore justly esteemed cordial. They manifestly increase the frequency of the pulse and the heat of the body; and are therefore ready to prove hurtful in all cases where these circumstances are already preternaturally increased, and especially in all cases wherein a phlogistic diathesis prevails in the system.

CINNAMOMUM.

This is an aromatic of the most grateful fragrance. Its oil is sufficiently acrid; but not being in large proportion in the substance of the cinnamon, as nature produces it, this may be employed more safely than most of the other aromatics.

As it is a bark, its aromatic qualities are accompanied with somewhat astringent, which may determine its being employed in certain cases rather than some of the other aromatics. But the astringent quality is not considerable, and can never be trusted to by itself.

Its aromatic qualities are extracted by water in infusion, but more powerfully by it in distillation; and in both ways also by a proof-spirit applied. And both the British dispensatories have

now also ordered a tincture of it made with proof-spirit. In all these ways it may be agreeably employed. But we should never lose sight of its being stimulant and heating; for even the simple disilled water, when frequently employed, has proved hurtfully irritating to the fauces.

The essential oil is only obtained by us as imported from the East Indies; and when obtained in its genuine state, it is one of the most agreeable and powerful aromatics we can employ.

Our college has now received into their materia medica list the *Cassia Lignea*, which has all the qualities of the cinnamon, only in a much weaker degree, and at the same time with no other peculiar virtue. It differs from the cinnamon by its containing a considerable quantity of mucilaginous matter: but we do not perceive that this can adapt it to any particular purpose.

CARYOPHILLI.

This is an aromatic of a very agreeable odour, and contains a large proportion of essential oil, by which it has all the virtues we have ascribed to aromatics in general. This oil, as distilled in this country from the cloves imported, does not appear to be a very acrid matter; but we have imported from Holland, an oil under this title, of very great acrimony. It is such an acrimony as we find in the extract of cloves obtained by means of spirit of wine. And it is therefore commonly supposed, that the oil imported from abroad, has its great acrimony from a quantity of the resin obtained by spirit of wine mixed with the oil. By this admixture it is certainly rendered more powerful for external use; and how far, when the dose is properly chosen, it is rendered unfit for internal use, I cannot well determine.

NUX MOSCHATA.

This is a substance abounding in oily matter, which is of two kinds; the one fixed, the other volatile, arising by distillation both with water and spirit. The fixed oily part is a butyraceous matter, without taste or smell, and therefore of no peculiar use in medicine. The volatile portion of it is of two kinds; as a part of it appears in a thin fluid oil, and another part disposed to congeal, puts on somewhat of the appearance of camphire, but has not, however, the nature of that substance.

The active part of nutmeg may be obtained not only by distillation, but also by a simple expression of the bruised nutmeg, when a butyraceous substance is obtained, known in our shops under the title of the *Oleum macis expressum*, having much of the odour of the entire nutmeg. It is commonly imported to us from abroad, but seldom in its genuine state.

Nutmeg is an aromatic, to most persons of a grateful odour and taste: but on account of the admixture of an inert sebaceous matter, it is of a less acrid taste than several other aromatics. By its volatile parts, it is a medicine of considerable power, and has all the virtues of the other aromatics, both with respect to the alimentary canal, and to the whole system.

Some writers have mentioned its hypnotic power: but *Dr. Lewis*, by his manner of expressing himself, does not seem to have known this from his own observation. *Bontius*, however, speaks of it as a matter of frequent occurrence in the East Indies, which had often fallen under his own observation; and in the *Ephemerides Germanicæ*, Dec. II^{da}. Annus II^{dus}, Obs. 120. we have an account of some extraordinary effects on the nervous system, occasioned by the taking in a large quantity of nutmeg. I have myself had an accidental occasion of observing its soporific and stupifying power. A person, by mistake, took two drachms or a little more of powdered nutmeg: he felt it warm in his stomach without any uneasiness; but in about an hour after he had taken it, he was seized with a drowsiness, which gradually increased to a complete stupor and insensibility; and not long after, he was found fallen from his chair, lying on the floor of his chamber in the state mentioned. Being laid abed he fell asleep; but waking a little from time to time, he was quite delirious: and he thus continued alternately sleeping and delirious for several hours. By degrees, however, both these symptoms gradually diminished, so that in about six hours from the time of taking the nutmeg, he was pretty well recovered from both. Although he still complained of head-ach, and some drowsiness, he slept naturally and quietly through the following night; and next day was quite in his ordinary health.

There is no doubt that this was entirely the effect of the nutmeg; and it is to me probable, that several other aromatics, taken in large doses, might have the same effects: from which I am of opinion, that in general the large use of them, in apoplectic and paralytic cases, may be very improper.

I have only to observe further, with respect to nutmeg, that its active parts are not dissipated by moderate boiling. The preparation of the *nux moschata condita* does not, as in many other instances of the *Condita*, deprive the nutmeg of its virtues: while it gives us a preparation convenient for several formulæ in which the nutmeg may be employed.

MACIS.

This is a part of the same fruit as the nutmeg, and has therefore very much of the same qualities, only it is of a somewhat different odour and taste: and it contains an oil, or at least a part of an oil, that is more volatile, and somewhat more acrid.

PIMENTO.

The aromatics hitherto mentioned are productions of the East Indies: the one we are now to mention is entirely from the West Indies, very much however of the same qualities as the Oriental aromatics. It is of a fragrant and agreeable odour of a peculiar kind, and seems as if it were a combination of those already mentioned. Like these it contains a large portion of essential oil that sinks in water. Its only use is as a condiment to food, and it has not any peculiar virtues in medicine that I am yet acquainted with.

CARDAMOMUM.

The species of amomum distinguished by the title of Cardamomum Minus. It is a seed of a grateful aromatic odour and taste; but not so acrid as several others. It has the common qualities of the other aromatics, depending upon an essential oil; that differs, however, from the others we have mentioned, as not sinking in water.

There is another species of the amomum, formerly kept in our shops under the title of *Grana Paradisi*; but as being precisely of the same nature with the cardamomum minus, and of weaker quality, it is now properly omitted.

GINGIBER.

This root is from a plant of the same genus with the former, and like it contains an essential oil of an acrid aromatic kind: it has therefore the same qualities of antispasmodic and carminative as the other aromatics. Its odour is to me less fragrant and agreeable; but its taste is more pungent and heating. By my observation, it is equally heating to the system as the other aromatics; and why *Dr. Lewis* thought it not so, I cannot understand; nor do I feel that the fixed nature of its active principles accounts for this, as in several aromatics, such as cloves and pepper, their fixed parts are more acrid than their volatile.

This root has much of its active parts extracted by water: and therefore it may be properly employed in infusions; and its infusion is properly enough converted into a syrup: but in doing this, it is not necessary, as both the colleges of London and Edinburgh have prescribed, to avoid boiling: for, as I have already observed, its active parts are not dissipated by boiling: and by boiling the ginger in water, a more powerful and equally agreeable syrup may be prepared at a less expence. It is on account of the same fixed nature of the active parts of ginger, that the gingiber conditum is a sufficiently active preparation of it, convenient in several formulæ: but that imported from the East or West Indies is to be preferred to any preparation of it made in this country.

ZEDOARIA.

I have set down this here as of the same genus of plants with the two last mentioned; but I hardly think it deserves the place it has hitherto held in our practice. Its odour and taste are less agreeable than that of any other of the aromatics hitherto mentioned: and its bitterness is too inconsiderable to give it a place amongst the tonics. I am clear that it might safely be omitted in our lists of the materia medica. As containing a camphire, it may have virtues; but I cannot find that from thence it is applicable with advantage to any particular purpose; though I have mentioned above the extravagant commendations given of it by *Cartheuser*.

PIPER.

This is the aromatic which, as a condiment of our food, is

much more frequently employed than any other: its odour is less fragrant and agreeable than most of the others mentioned, and therefore perhaps less liable to pall upon us than those others whilst its taste is more pungent and durable. It contains an essential oil, which, like that of the other aromatics, sinks in water, but is less acrid than the pepper itself: and it appears from the experiments of *Gaubius*, that the most active parts of pepper are of a very fixed nature. They may be taken out by water; and by inspissating, the decoction may be had in the form of an extract of the most acrid quality. By this part, which seems to be a resinous substance, and by its essential oil, it has all the powers and virtues of the other aromatics.

Newmann, however, from attending only to the qualities of the essential oil, has supposed pepper less heating to the system than other aromatics: and the late learned *Dr. Gaubius* entered into the same opinion. For supporting it he appeals to his own experience: and says pointedly, that from any, and even large quantities taken in, he never found it warm on his stomach, or to increase the frequency of his pulse.—This I suspect to have been owing to habit, from his frequent use of it; for my experience has been of a contrary kind. I have all my life had a dislike to the odour and taste of pepper: which I ascribe to an instinct of my constitution: for when I have taken this spicery though in a small quantity, it always felt warm in my stomach, and my whole body was heated by it.

It seems to me that *Linnaeus* and *Bergius* judge very properly, and probably from experience, in ascribing a calefacient power to pepper: and *Dr. Lewis* is expressly of opinion, that pepper heats the constitution more than some other spices that are of equal pungency upon the palate.

Bontius properly treats as ridiculous the opinion of the Javaneſe, who consider pepper as of a cold nature. The universal use of it in India not proving remarkably hurtful, which *Gaubius* appeals to, may be considered as the effect of much habit, which the use of vegetable food has introduced: and it may be maintained, that the popular opinion of its innocence, and even of its utility, is given upon no solid ground, but merely in vindication of popular practice; which, in several like instances, has given occasion to such popular errors.

For the heating powers of pepper, I would require no other proof than that it is effectually employed for preventing the return of the paroxysms of intermittenſt fevers, by being given some time before an expected accession: and which purpose I think it can no otherwise answer than by exciting a considerable degree of heat in the system. For its heating effects, see *Van Swieten*, Comm. in *Boerh.* Vol ii. p. 31.

PIPER LONGUM.

This is the product of the same genus as the former. It has precisely the same qualities, only in a weaker degree; and there-

fore should not have had the place of it, that it has had, in some of our shop compositions, as in the tinctura aromatica both of the London and Edinburgh dispensatories, in the vinum amarum, the pulvis e bolo compositus, the species aromatica, and the confectio paulina of the former; in all of which the piper nigrum might have been as properly employed. *Dr. Lewis* judges the long pepper to be warmer than the black; but *Bergius* judges otherwise, and so do I.

CUBEBAE.

This also is from the same genus of plants as the two kinds of pepper mentioned; and has the same qualities, but in a still weaker degree, and therefore might be left out of our list. But its odour is more fragrant and agreeable than either of the peppers: and it makes a more agreeable ingredient in the vinum amarum than either the pepper or the ginger.

CAPSICUM.

This is given in our dispensatories under the title of Piper Indicum; and though from a very different genus of plants, it has been from its acrimony universally named a Pepper. It has the acrimony of the pepper in its taste, but without any of the odour of that, or any other aromatic that I know of. It is now very universally employed as a condiment; but has hardly yet had any place in medicinal prescription.

A particular use to which it may be applied is to be learned from the following passage and prescription in *Bergius*.

“ R. Semin. piper. Ind. gr. vi. bacc. laur. ij. ꝯ. M. f. pulvis, dividendus in tres, partes æquales; quarum prima portio sumenda incipiente primo rigore, secunda postridie eadam hora; tertia vero tertio die. Sæpissime vidi febres intermittentes protractas hocce pulvere curatas plerumque sine relapsu.”

CANELLA ALBA.

This is a substance, both by its odour and taste, to be reckoned amongst the aromatics: but these qualities are in a weaker degree than in most of the aromatics we have mentioned. It has no peculiar virtues; and has only been employed for improving the odour and taste of bitters; which purpose it answers in the tinctura amara of the Edinburgh dispensatory, better than the ginger proposed to be employed by the London College.

CORTEX WINTERANUS.

Under this title, for a long time past, the canella alba has been employed all over Europe; and it is still in Britain only that a genuine *Winter's* bark is yet known. *Bergius* has this observation: “ Plurimi auctores corticem Winteranum a canella alba distinguunt; mihi vero alius cortex Winteranus, quam hic, ignotus est.”

This is the state of matters in other countries. But of late years our circumnavigators have brought us from the Straits of Magellan, a bark which is certainly the original *Winter's* bark; and is a substance considerably different from the canella alba.

By the accounts which the late *Dr. Fothergill* has inserted in the London Med. Obs. the genuine Winter's bark appears to be a light and grateful aromatic bitter; but of what particular use it may be in medicine, is not yet ascertained. Its being a preservative against the scurvy is not ascertained upon any clear foundation. For all that we know concerning it, I must refer to the London Med. Obs.

I. A C R I A. ARUM.

This root is of a singular composition. As it is produced in the earth, it contains an acrid matter which is not to be extracted by spirit of wine, and is not therefore an essential oil. Though the acrid matter gives out no odour, its acrimony readily passes off in drying, and exhales under decoction in water. But it does not rise with either water or spirit in distillation, so as to give any impregnation to the distilled liquor.

Beside this acrid matter, which is in small proportion to the whole, the root consists of a farinaceous and nutritious matter: it is therefore the acrid matter only that renders it an active medicine. The acrimony of it appears in the application of the fresh root to the skin; which, if delicate, is reddened by it, and some blistering is excited: but in this respect it is not so inflammatory as several other substances mentioned above. Taken internally, it stimulates the stomach, and excites the activity of the digestive powers when they happen to be languid; and we have this proof of its stimulating the whole system, that, like other stimulants, it has been useful in intermittent fevers.

Bergius gives an account of its singular virtue in curing certain headachs; and that there may be no mistake of his meaning, it seems proper to lay the whole paragraph before my readers. "Præclarum affectum identidem expertus sum ex hac radice, alcalinis, absorbentibus, et aromatibus maritata, in cephalæis sympaticis pertinacissimis. Hæc species cephalææ omnes eluserat medelas, antequam in pulverem ari compositum incidebam. Scilicet sympatica ea est aprimis viis, forte ab atribili profecta dolore capitis insane vehementi cruciantur ægri sæpe per intervalla recrudescente, absque febre, pulsu subinde nimis tardo, plerumque vero naturali. Sæpe linguæ basis ipsique dentes nigrescunt, velut apud illos qui ore tabaci fumum hauriunt. Venæfectiones hirudines, scarificationes, vesicatoria, laxantia, aquæ minerales, in hac specie cephalææ nihil efficiunt sed sæpe augment dotorem; quod etiam accidit a propinatis salinis. Sed pulvis ari compositus nunquam non solatium attulit. In febribus intermittentibus pulveris dedi quovis bihoria e Rad. ari solid. et tart. vitriol. a ð fs. rhei. sel. gr. v. Illi purgarunt alvum mediocriter, et subinde febrem sustulerunt, quandoque absque relapsu; sed apud sensibilibiores tormina excitarunt, quare dosis ari tunc diminuenda fuit."

Juncter tells us that, given with brandy, it is a very powerful sudorific: but the accuracy and judgment of that author deserve very little attention.

Formerly it has been frequently employed in the practice of England; but in this country, so far as I know, very little. In England it was especially employed in the pulvis ari compositus of the last edition of the London dispensatory, which was a very injudicious composition, and is now entirely omitted. The pulvis ari compositus of the Edinburgh dispensatory, 1756, is somewhat better; but still so much loaded with other ingredients as to render it uncertain what may be the effect of the arum, what of the other ingredients; and it is in the latter editions, as an officinal composition, properly omitted.

Bergius proposes to mix it only with an equal part of vitriolated tartar, and half the quantity of rhubarb. *Dr. Lewis*, finding that the pungency of it may be well covered with mucilaginous and oily substances, proposes two parts of the root, two of gum arabic, and one of spermaceti, to be well rubbed together, and then made into an emulsion with any watery liquor. "In these forms (he says) I have given the fresh root from ten grains to upwards of a scruple, three or four times a-day. It generally occasioned a sensation of slight warmth, first about the stomach, and afterwards in the remoter parts; manifestly promoted perspiration, and frequently produced a plentiful sweat. Several obstinate rheumatic pains were removed by this medicine, which is therefore recommended to further trial."

Bergius directs this root to be gathered only when it has ripened its seeds, and the plant begins to decay: and *Dr. Lewis* gives I think, the proper reason of this. He supposes that the root is of sufficient vigour for medicinal use at all periods of its growth. But as it has hitherto been used only in a dry state, it has been generally taken up about the time of the plant's beginning to die; as the root is the least juicy, and shrinks least in drying.

MEZEREON.

This plant, as one of the most acrid, though omitted in our catalogue, deserves to be taken notice of here.

It is the bark of the root of this shrub that is only employed. The woody part of the root is quite insipid: and apothecaries deceive themselves in taking any part of the wood along with the bark. This bark contains a very acrid matter, which, applied to the skin, readily excites a blister, and a considerable discharge of serum: and as by repeated applications this can be continued without any erosion of the part, it has been frequently employed in France as a perpetual issue, with all the effects of such remedies. Directions are given for the management of it by Mr. Baume, in the last edition of his *Elemens de Pharmacie*. They are given more fully in *Essai sur l'Usage et les Effets de l'Ecorce du Garou*, par M. Archange le Roy, Paris. 1767, and they are also transcribed by *Bergius*.

The mezereon, to be used internally, is taken in a decoction of two drachms of the root, boiled in three pounds of water into two: and the whole of this is taken, at several draughts, in the course of twenty-four hours. In this proportion it proves somewhat warm on the stomach: and in larger proportion it gives a painful warmth, with sickness and even vomiting. It sometimes renders the pulse frequent, and heats the whole body. It has had the reputation of curing venereal nodes, which mercury had failed to do; and for its use in such cases, see *Russel*, in *Lond. Med. Obs.* Vol. III. art. 22.

It is likewise said to cure other remains of the venereal disease, which mercury, taken in large quantities, had failed to do. And in one case of ulcerations in many different parts of the body, which remained after mercury had been long and largely employed, I have found them entirely cured by the use of the decoction of mezereon for two or three weeks.

Dr. Home has not only found this decoction to cure scirrhus tumours which remain after the venereal disease, and after the use of mercury, but that it healed also some scirrhus tumours from other causes. I have frequently employed it in several cutaneous affections, and sometimes with success.

PULSATILLA NIGRICANS.

This is one of the remedies which we owe to the benevolent industry of *Baron Storck*. But he has ascribed to it so many wonderful effects, that his credit is hurt with many persons, and has made many neglect to give this remedy a frequent and fair trial. It has particularly concurred with this in Scotland, that the plant is not a native of this country, and that there has not been ready access to it. But whatever may become of the credit of *Baron Storck's* experiments, I must observe that the plant is an acrid substance, and therefore capable of being active; and from the singular matter resembling camphire, which water distilled from it contains, it may have peculiar powers and virtues.

I would still recommend it to the attention of my countrymen, and particularly to a repetition of trials in that disease so frequently otherwise incurable, the anourosis. The negative experiments of *Bergius*, and others, are not sufficient to discourage all trials, considering that the disease may depend upon different causes; some of which may yield to remedies, though others do not.

Besides the whole of the above list, there are some other stimulants which have been formerly employed in medicine; but not discovering any peculiar qualities, they have been of late neglected: and I have therefore now taken notice only of the few that still keep a place in our dispensatory lists. In making these omissions, I cannot however fail to observe, that it is from the most acrid, and perhaps poisonous substances, that is, in those which act most powerfully on the human body, that we are to expect powerful remedies; and though they are at present pro-

perly omitted in our dispensatory lists, as not proper to embarrass the apothecary, they are, however, proper objects of inquiry to all persons who would improve the practice of physic.

CHAPTER VI.

SEEDANTIA.

THESE are the medicines which directly, and without evacuation, diminish the motions and powers of the human system. They are of different kinds, as they act more immediately upon the nerves or sanguiferous systems; and we are to treat of them accordingly under the titles of Narcotics or Refrigerants; the former to be first considered here.

SECT. I. OF NARCOTICS.

THESE are the medicines which diminish the sensibility and irritability of the system, and thereby the motions and the powers of motion in it. They are commonly remarkable for inducing that cessation of sense and motion in which sleep consists; and are therefore often named *Soporific* or *Hypnotic* medicines.

As their power and operation may be extended so far as to extinguish the vital principle altogether, they form that set of substances which are properly, and such as may be strictly, called the *Poisonous*.

As the powers of sense and motion chiefly depend upon the state of the brain; so it has been commonly supposed that the medicines we treat of, act primarily and especially upon that organ: but not to mention the objections that might be made to any hypothesis that has been maintained on this subject, it will be enough to remark, that as the operation of narcotics diminishes the motions and powers of motion, especially in the parts to which they are immediately applied, and that they do this in parts which are entirely removed from all connection with the brain; we must conclude, that their operation is upon a matter in common to the whole nervous system.

To be more explicit on this subject, we assume the hypothesis we have before maintained, that there is a subtle elastic fluid inherent in the medullary substance of the brain and nerves, upon the motions of which all sense and vital motions depend; and by which, therefore, motions are communicated from every one part to every other of the nervous system.

From many phenomena it appears, that the mobility of this fluid may be more or less at different times: and particularly that it may be affected in these respects by external bodies applied to the nerves. Such then we conceive to be the operation of

narcotic medicines, that they diminish the mobility of the nervous power, and in a certain quantity can destroy that mobility altogether. This is, in general, the operation of narcotic sedatives; but it suffers various modifications, which, though we cannot clearly explain, we shall, in considering the particular narcotics, endeavour to go further than has been done before.

After this general idea of the operation of narcotics, it is to be remarked, that although their operation is, as we have said, first, and especially on the nerves, to which they are immediately applied, they are very constantly at the same time extended to other communicating nerves, more or less, according to the number and sensibility of the nerves to which they are first applied.

The most remarkable and frequent instance of this is in the application of narcotics to the internal surface of the stomach: where both the number and peculiar sensibility of the nerves give occasion to a very extensive widely diffused operation: for it is to be further remarked, that almost every application to a particular part, is communicated more or less to the origin of the nerves, or common sensorium; from which, again, its operation is more or less communicated to the whole system.

From the accounts just now given, it will be obvious, that it is especially, and most commonly, from the operation of narcotics on the stomach, communicated to the brain, that general effects so readily appear in the whole system: and it is accordingly these effects, extending from the sensorium to the whole system, that have been chiefly attended to in the operation of narcotics.

But it is proper to be more particular, and therefore to observe, that the effects of our narcotics, commonly and especially, first appear in those functions in which the mobility of the nervous fluid admits the most readily of a change; that is, the animal functions, in the cessation of which sleep consists: and therefore it is that this is so commonly induced.

At the same time, the effects appear also in the vital functions, so far, that the motions of these are weakened, and the frequency of their action rendered less; and although this, from considerations to be mentioned afterwards, may not constantly appear, there are, however, innumerable experiments which prove, that it is frequently, and even commonly, the effect of narcotics.

The power of narcotics, in diminishing the mobility of the nervous power, appears still more considerably, and without ambiguity, in the natural functions. Thus, the activity of the alimentary canal, that chief organ of the natural functions, is always diminished by narcotics any how thrown into the body.

Another effect of narcotics, relative to the natural functions, is the diminution and suspension of all secretions, and of every excretion except that of sweat.

From all this it appears, that the operation of narcotics extends to every function depending upon the energy of the brain:

with respect to which they show a sedative power; which, though various in its degree, and variously modified, both by the different conditions of the narcotic, and by the different conditions of the body to which it is applied, yet the effects are universally and directly sedative. There is, however, here, a considerable difficulty occurring; as it is to be particularly remarked, that narcotics, instead of proving always sedative, or diminishing the action of the heart, often seem to be powerfully stimulant with respect to this, and in their first operation often increase the force and frequency of its action.

How this, in consistency with our general doctrine, may be explained, is difficult to say. Some have imagined, that in the same narcotic substance there is a stimulant as well as a sedative matter: and that they have some foundation for this opinion, appears from this, that the substance of the narcotic is acrid to the taste, and when applied to the skin readily inflames it; and that in wine, or other ardent spirits, commonly acting as narcotics, the stimulant matter is in large proportion, may be readily admitted.

But on the other hand, the direct stimulant power is doubtful; as in many substances the sedative power appears in masses of so very small bulk: and in that bulk the stimulant matter can hardly be in such proportion as to stimulate the heart very powerfully; as we know no other instance of a pure stimulant that in the same bulk will have that effect, even when applied to the stomach or in any other way to the body. Another consideration may be also offered here. There is no ground to suppose, that where a stimulant and sedative power are combined in the same matter, that, as frequently happens here, the stimulant power should commonly act before the sedative.

To explain therefore the stimulant effects that often appear from the exhibition of narcotics, it seems necessary to assign some other cause than the direct stimulant power of the substance applied; and it appears to be that resistance and consequent activity, which the animal œconomy is suited to oppose to every application that has a tendency to hurt it.

This power, as we have said before, is well known in the schools of physic, under the title of the *Vis Conservatrix et Mediatricix Naturæ*; which, however difficult to explain, must, as a general law of the animal œconomy, be admitted as a matter of fact, as we have above, on the subject of stimulants, endeavoured to prove very fully.

We have no doubt that it might be fairly employed here, to account for the stimulant effects which so often appear upon the exhibition of narcotics, which are indeed very often evident and considerable: but they do not imply any directly stimulant power in the narcotic substance, as they can be so well accounted for by considering them as indirect stimulants, in the manner we have both here and above explained.

I will only add one other illustration on this subject. It is frequently the effect of narcotics to excite that delirium which is well known under the name of Ebriety or Drunkenness. This often appearing with the same circumstances that are ascribed to a stimulant power, has been frequently supposed to arise from a stimulus applied to the brain: and it is true that it does in some measure depend upon the stimulant operation which here takes place in the manner we have explained: but were it proper here, it might be shown by the laws of the animal œconomy, that a stimulus is commonly insufficient: and that it is only by the concurrence of a sedative power, that the symptoms of ebriety produced by the exhibition of narcotics, can be accounted for.

We conclude therefore upon the whole, that the operation of narcotics is always directly sedative. But before we proceed to illustrate this in particulars, it will be proper to take notice of a circumstance that relates to the operation of sedatives in general. With respect to them, it is to be remarked, that when sedatives thrown into the body do not prove absolutely mortal, their operation is of a certain duration only: and therefore, after a certain time, or at least sooner or later, according to circumstances, it entirely ceases, or at least its effects are greatly diminished.

It is in consequence of this, that, when for the purposes of medicine, it is necessary that the effects of narcotics be continued, this can only be done by a repetition in due time of the sedative: and upon such occasions it is found, that the law of the œconomy, by which all impressions which do not excite to action, by repetition become weaker, here takes place: and therefore that, in the repetition of narcotics, the impression, that is, the dose, must be made stronger than before. This happens constantly in the repetition of narcotics; and to persons acquainted with the powers of custom, affords an argument, that in most instances those narcotics act by their sedative rather than by their stimulant powers.

This ceasing of the effects of narcotics is difficult to explain: and to do it, we must take notice that it is connected with a question occurring with respect to natural sleep, which is, whether this, after it has taken place for some time, always ceases from stimuli applied; or if it ceases spontaneously upon the system being restored to the state in which it was before the causes of sleep were applied? The latter account will be adopted by those who suppose the nervous fluid to be a secretion that may be exhausted, and again restored and supplied. But this is a supposition so improbable, that I believe few maintain it at present: and if so, the question returns to say, how the state of the nervous fluid, either when natural sleep has subsisted for some time, or when it has been artificially induced by narcotics, returns or is restored to its waking condition?

Although it may be difficult to explain what physical or mechanical condition the different states of sleep and waking consist

in, it is highly probable that these two states do truly alternate with each other. That the state of waking does necessarily induce the state of sleep, will be readily admitted: and it is equally probable that a certain time of sleep does not only take off the state of sleep, but does also induce the condition necessary to the waking state. If this is admitted with regard to natural sleep, it will be readily allowed that the same means will also operate on the state induced by narcotics, and will therefore at length put an end to it.

These are the considerations I can offer with respect to Sedatives in general: and what might be further attempted in this way will appear more properly from what is to be said of the particular substances, to be treated of under this title. And I begin with the consideration of that sedative, which of all others has been the most employed in medicine.

PARTICULAR NARCOTICS.

OPIUM.

This is procured by various means, from a species of poppy, which has properly got for its trivial name that of *Papaver Somniferum*. The botanical history of this plant, and the various means of procuring opium from it, have now been described in so many different books, that it is by no means necessary to repeat them here, or to determine by which of them the opium of our shops is particularly obtained: and I omit more readily any accounts of these, as it seems sufficiently probable, that though they may give substances of different degrees of purity and power, they do not give a medicine of different qualities: and we shall now proceed to consider that quality as it is found in the opium common in our shops.

In the first place, we shall consider its operation and effects as in general with respect to the animal œconomy; and afterwards consider how these effects are varied and modified by the circumstances of particular diseases in which they are employed.

The general effects of opium are very much the same with those mentioned already as in common to narcotics; and indeed these were chiefly taken from the example of opium, though a more particular consideration may still be proper here.

The general effect of narcotics, and perhaps every particular effect that has been taken notice of, we suppose to depend on the power of these substances in diminishing the mobility, and in a certain manner suspending the motion of the nervous fluid.

This we prosecute therefore more particularly with respect to opium: and the operation of this that seems first to be taken notice of, is its power of inducing sleep.

This is a state of the animal œconomy which spontaneously occurs in man, and perhaps in all other animals in their natural and healthy state, once in the course of every diurnal revolution of the sun.—In man, in whom only we are particularly concerned,

it is variously modified. But in its most natural and complete state, it consists in a total cessation of the exercise of all sensation and thought, and consequently of all intellectual operation; and at the same time therefore of all exercise of volition, and of the motions of the system depending upon this.

As we take it here for granted, that all exercise of sense and voluntary motion depend upon the motion of the nervous fluid to and from the brain, we conclude that sleep consists in a suspension of these motions. The causes of this suspension have been variously assigned: but it does not appear necessary to consider these several opinions here; as we suppose it to be demonstrated elsewhere, that it depends upon the nature of the nervous fluid itself, disposed to the alternate states of torpor and mobility.

What is the physical or mechanical condition of the nervous fluid in these different states, we do not pretend to explain; but it seems to be enough for our present purpose to say, that opium produces the same state that occurs in natural sleep. As in this, therefore, the motions from the extremities of the nerves to the sensorium cease, we can readily understand how opium, producing this state, can produce a cessation of all sense of pain or other irritation arising from any part of the system.

At the same time, as in sleep, the exercise of the will and every motion from the brain to the other parts of the system entirely cease; so opium can suspend every motion from the brain into the voluntary organs, whether the motions in these appear in the form of convulsion or spasm.

But not only do these powers of opium appear in the animal functions; but in so far as the other motions of the system depend, as I presume they do, on the constant energy of the brain, opium certainly diminishes the force of this, and thereby diminishes, and to a certain degree suspends, all the vital and natural functions.

To prosecute the analogy of natural sleep with that induced by opium, it is proper to observe, that natural sleep occurs more or less readily as the causes producing it have been greater or less; and chiefly therefore according to the labours of the preceding day: but more certainly if those irritations commonly arising from the exercise of the functions, or from external impressions, are more completely absent; and particularly those of the former kind, arising from interrupted digestion, from the earnestness of mental occupations, and from the increased action of the sanguiferous system.

Making allowance for these circumstances, the occurrence of sleep is very much under the government of a periodical revolution which the system is subjected to: and under the influence of this, it may occur at its usual period, though the labours of the preceding day may have been much less than usual; and it will

only be prevented by some of the irritations just now mentioned, or others prevailing in the system.

When sleep occurs in spite of the circumstances that have a tendency to prevent it, it will be broken by those irritations, that is, by the causes of watching frequently intervening; or if these do not proceed so far as to excite watching, they may render the sleep incomplete, by producing only a partial interruption of thought; and as this exercise of thought, when it is partial only, must be irregular, so it must produce that incoherent and inconsistent thinking which we call dreaming.

According to the degree of the causes, dreams may be mild, and perhaps agreeable; or, according to the violence of their causes, they may be more turbulent, and with more emotion produced. It appears that, even from moderate causes, they are different; and prove either cheerful or gloomy according to the tone of mind prevailing in the person affected; but why, from violent causes, they are generally of the frightful kind, I cannot explain.

Such are the different states of natural sleep: and when it is over, the effects of it are also different, while there is either a sense of ease from all the irritations which the system was affected with before, and when the sleep is said to be refreshing, or there remains some of those irritations that had disturbed their sleep, and therefore give a desire of its continuance.

Whether, without any such irritations, the state of sleep does not give a disposition to its continuance, I leave my speculating readers to consider. But, however they may determine, it will not affect the proposition I maintained above, that the state of sleep induces the state fit for watching; since it is evident that a state of sleep subsisting for some time induces a state of the system more ready to be affected by stimuli of all kinds.

Analogous to these different states of natural sleep, and of its consequences, are the states induced by opium. If the system is tolerably free from irritation, opium induces a sleep which would not have spontaneously occurred. Even though some irritations should prevail, if these be moderate, opium, by diminishing sensibility, may induce sleep, and will do it more or less according to the dose employed. In some cases, though the power of the dose employed may not be sufficient to induce sleep, it may be able to take off, or at least to diminish, the causes of restlessness which had prevailed, and thereby give a tranquility, that, subsisting for some time, is often found equal to the refreshment of sleep.

There are, however, cases in which the irritations of the system are too strong to be overcome by the force of any moderate dose of opium; and in such cases no sleep is produced; and at the same time the conflict arising between the stimulant irritations and the sedative power of opium, gives a farther irritation to the system, which is often very hurtful to it. Such, however, is the force of the sedative power of opium in inducing sleep, that

if the dose be large, it will overcome very strong irritations. And it is to be remarked, that the conflict just now mentioned, often arises from the dose of opium being too small, and when a larger would have prevailed over the irritations more entirely.

The management of this, which is often a difficult matter in practice, must be directed by the nature of the irritations prevailing. It appears, that when the irritations are primarily and especially applied to the brain, and not at all to the sanguiferous system, the force of opium may be employed very freely, and to any extent; and in a large dose will always either take off the irritation entirely, or at least for some time suspend its operation; and from thence it appears, that in purely nervous cases, opium may be employed in very large doses with great safety.

But I have observed above, that narcotics, and particularly opium, in its first operation, often irritates the sanguiferous system, and excites the force of the circulation. And, however we may dispute about the causes of this, the fact is certain; and that this, in a certain degree, gives opium the powers of a cordial and exhilarant. On this occasion, it is to be observed, that tho' the action of the stimulant should not entirely prevent the sedative power, it often puts it off for some time, to give what we may call the intermediate state of ebriety; which, according to the balance between the stimulant and sedative power, may appear more or less, or may subsist for a longer or shorter time, and may therefore more particularly explain the operation of opium in different persons and cases.

The consideration of the stimulant power of opium will particularly explain, why, in persons in whom the stimulant power is considerable, the effects of a moderate dose of opium, instead of inducing sleep, may, by the increased action of the heart, appear to prevent it: and this probably may also be a frequent cause of opium's not inducing sleep. It will also be obvious, that in any case when any irritations already prevailing in the system, and preventing sleep, depend upon an increased action of the heart and arteries, the addition of the stimulus of opium, more ready to take place in such cases, must certainly prevent sleep, with all the bad consequences of the conflict above-mentioned. In many cases, however, the sedative power does prevail, and at length induces sleep; the state of which sleep, and its effects, may be understood from what is said above.

If the sedative power of opium prevails, not only over the general energy of the brain, but also over its exertion in increasing the action of the heart, the effects upon the whole may perhaps be salutary. But if the irritation of the heart either continues after the action of the opium has ceased, or be then, from that very action, more easily renewed, the effects may certainly be pernicious.

It appears clearly, that the stimulant and sedative powers of opium operate at one and the same time; and in no instance more

remarkable than in that of opium proving powerfully sudorific. The increased action of the heart, however excited, has a tendency to promote sweating. But every body knows that it is difficult to produce sweating by the power of medicine purely stimulant: and at all times opium has been found to be the most effectual of all sudorifics. This, by some, may be ascribed entirely to its stimulant power; but it is highly probable that the sedative power, concurring at the same time, by relaxing the extreme vessels, renders the sweating a more certain effect, and more considerable in its degree.

Are not the sweatings which often occur in natural sleep, and particularly the colliquative sweat in hectic, analogous to this, as depending upon an irritation and weakness of the extreme vessels concurring together?

Before I finish the operation of opium in general, it is proper for me to consider what changes it may produce in the state of the fluids. It has been very commonly imagined that opium rarefies the blood; but I can find no foundation for this. In many instances it produces its effects on the nervous system while it is yet in the stomach, and before it can be supposed to have reached the mass of blood, and often before it appears to increase the action of the heart. But even supposing some portion of it to be introduced into the blood-vessels, whilst it is not alleged that it acts as a ferment, we trust to the general principle, that no kind of matter applied in small proportion can have any considerable effect upon the mixture of a much larger mass.

By an argument therefore *à priori*, I conclude that opium does not rarefy the blood. It is, however, alleged as a fact that it does so; but we maintain that the symptoms which are supposed to be in proof of this, may be owing only, or entirely, to the increased action of the heart and arteries, which will often give such appearance without any change in the state of the blood. And if it be further alleged, that after the use of opiates, the vessels are found in a more turgid state, we are ready to admit the fact; but are disposed to impute this to the slower motion of the blood in that case produced, by the weaker action of the extreme vessels giving occasion to the accumulation of it in the larger; and that this will appear, especially in the vessels of the head, and in the system of the vena portarum; in both of which the blood is more liable to stagnate in every case of languid circulation.

With respect to the fluidity of the blood in consequence of the frequent use of opium and other narcotics, we may admit the fact; but we suppose it to be in consequence of a state of the circulation rather than of the effect of mixture; the experiments adduced in proof of the latter opinion being made on blood drawn out of the vessels, and with such a proportion of mixture as cannot by any means be applied to them while they are in circulation, and therefore that such experiments do not afford any conclusion.

Having now considered the effects of opium upon the human system more generally, I proceed, in the next place, to consider how these general effects are suited to the circumstances of particular diseases: And first, of its employment in continued fevers.

The nature of continued fevers was, in former times, little understood by physicians; and I flatter myself that I have somewhat advanced the state of our knowledge on this subject: though I must allow that there are several circumstances of continued fevers not yet sufficiently explained and understood. For the general doctrine, so far as I have been able to deliver it, I must refer the reader to my other writings: and must confine myself here to those parts of the doctrine which relate to the use of opium in continued fevers.

To this purpose we are disposed to think, that almost all our continued fevers arise from contagion, or from certain corruptions of human effluvia proving such; and it is highly probable that those contagions, or matters similar to them, act as sedative powers, and, applied to the human body, produce a debility, which both induces the fever and subsists through the whole course of it, proving the circumstance from which the danger of fever chiefly arises. In this view of the matter, opium, as a stimulant to the heart and arteries, may be considered as a principal remedy in fevers: and as such we are disposed, with the most part of our present practitioners, to consider it: but that it is universally such, and in every circumstance of fever proper, we are very far from thinking.

In very many of the fevers of this climate, there appears in the beginning of them to be more or less of an inflammatory diathesis in the system; and during this state, I hold, and have often seen, the use of opium to be extremely hurtful. It does not then either induce sleep or relieve pain, but aggravates the inflammatory symptoms, and often determines to particular inflammations, which prove afterwards fatal.

In different fevers this inflammatory state is in different degrees, and of different duration. In some cases of the most powerful contagions, it may appear very little: and such cases may very possibly admit the early use of opium. But in most of the cases in which cold so frequently concurs in the production of the fever, we suppose that such inflammatory state commonly subsists for the first week of the disease; and therefore, for that space of time, we hold opium to be a dangerous, and at least an ambiguous remedy.

As the disease advances, the inflammatory state generally disappears in the second week, and the symptoms of debility become more evident. In this condition opium may be employed and more or less as the symptoms of debility and irritation are more distinctly apparent; but even in this second stage, it is an ambiguous remedy. And if it increases delirium, and does not readily induce sleep, it may be very hurtful: and is therefore to be employed with great caution.

In this advanced state of fevers, there is a circumstance which occurs that we are assured of as a fact, though we cannot well explain it. The cause of fevers gives an irritation to the brain, which is not of the inflammatory kind, but produces convulsive motions of the limbs to a considerable degree: and to this irritation it is that we impute the subsultus tendinum, so much taken notice of as occurring in the advanced state of fevers.

The same irritation also frequently produces a delirium; which, as not of the phrenetic and inflammatory kind, we name the Maniacal. To remove these effects of irritation I find opium to be a sovereign remedy: and it may not only be employed freely, but must commonly be given in large doses, and these also repeated every eight hours, unless sleep and a remission of the convulsive motions and delirium shall allow of longer intervals. For some time, however, in the advanced stages of fever, though these symptoms, by the use of opium, may be much abated, they are liable to recur, unless they are obviated by the repetition of the opiate.

There is still another circumstance in the advanced stage of fevers that on this occasion requires to be taken notice of. Though the most part of our fevers arising from contagion may have little general inflammatory diathesis accompanying them, and be on the contrary attended with much debility, there occurs however, from causes not easily assigned, some topical inflammation of the brain, which has frequently appeared upon dissection, after fevers of the most nervous or putrid kind. These topical inflammations, and the delirium attending upon them, do not admit of opium, and all their symptoms are much aggravated by it. The existence, however, of such topical inflammation, is not always easily ascertained; and some suffusion of the eyes is not always a certain proof of it. But we can give no better directions for the management of this matter than those given by Sir John Pringle, with respect to the use of wine in the jail fever.

These are the remarks I have to offer on the use of opium in continued fevers. Many are fond of a more free use of it than had been common before; and have believed that this was introduced by a certain noted teacher and author. But I assert, that I myself was the first who freely and largely employed opium in fevers, under certain restrictions indeed, which, neglected by other practitioners, have occasioned much mischief.

In the cure of intermittent fevers, opium, or some of those compositions of which it was the chief ingredient, were very much employed by the ancients. But since the use of Peruvian bark has been introduced, opium has been less employed, and only by persons who were prejudiced against the bark. Mr. *Beryet*, of the Academy of Sciences, without knowing any thing of what had been done before, has endeavoured to recommend the use of opium; but without showing any understanding of the nature of the disease, or of the remedy he proposes to be em-

ployed. He has been, therefore, so far as I know, little followed by any practitioners since that time.

To judge properly of its use, we must attend to the nature of the disease, which I hope is better understood now than it was before. It appears to me clearly, that the recurrences of the paroxysms of intermittent fevers depend upon the recurrence of a state of debility; and that this is to be prevented either by the use of tonics or stimulants, which may excite the action of the heart and arteries, and support that excitement till the period of accession is over.

For this purpose, various means of exciting fever and sweat have been employed; and there is perhaps no medicine that can be more effectually employed for that purpose than opium. It appears that *Dr. Boerhaave's* sudoriferum antipyreticum raro fallens derived its chief virtue from the two grains of opium which it contained, and which determined it to act as a sudorific. Opium alone has been employed, by being given an hour or two before the time of accession; and has prevented the return of a fit without exciting sweat, and merely as a stimulus and antispasmodic. But the consequences of this, as marked by Baron *Storck* and others, have been sometimes bad: and it seems that the safe and more certain practice will be, to direct opium to operate by sweating.

We need hardly say here, that almost every practitioner has found it useful to join opium to Peruvian bark, or other tonics, in the cure of intermittents. Not only in correcting the purgative quality of the bark, which sometimes take place, but even where no such purgative quality is to be apprehended, we are certain that a quantity of opium, joined with the bark, makes it sit easier upon the stomach than with certain persons it would otherwise do; and that a portion of it, joined with two or three doses of the bark, which are given immediately before the time of accession, enables it, in less quantity than it would otherwise do, to prevent the return of paroxysms.

A particular use of the bark in intermittents has not long ago been proposed and practised by *Dr. Lind*, of Haslar, which is the giving opium in the time of the hot stage of the paroxysms. As I have had no experience of this practice, I cannot either recommend it, or offer the suspicions I have of its being improper.

We proceed, in the next place, to consider the use of opium in inflammatory diseases, in which the practitioners of almost all ages have declared it to be hurtful. And we should be much surprised if any person engaged in practice for any length of time had not found it frequently to be so. The reason of it is also obvious; for, if inflammatory diseases consist in an increased action of the heart and arteries with a phlogistic diathesis, which causes and supports this increased action, it is highly probable that every stimulus applied to the system must do the same, and thereby aggravate the disease. But opium, on many occasions, as we have said already, is a stimulant power; and whoever

denies this, as some in writing have done, appears to deny and misrepresent facts admitted by every body else. For my part, I conclude with the utmost confidence, that opium, in general, is hurtful in all inflammatory diseases, and disposed to increase the phlogistic diathesis of the system. And as all practitioners are agreed that blood-letting affords the most effectual means for the cure of that diathesis, so we are persuaded of the propriety of *Dr. Young's* general rule, that opium is improper in all those cases in which blood-letting is necessary.

But I must allow, as he does, that there may be exceptions, or circumstances in certain inflammatory diseases, that may admit, or perhaps require the use of opium. Such are those cases in which the inflammatory state arises from irritation in a particular part producing spasm and supervening inflammation. Thus, in cases of jaundice, I have found a biliary stone, in passing the biliary ducts, give such an irritation as to produce a considerable degree of inflammatory state in the system: and though I have found it necessary, for moderating this, to employ blood-letting, yet, as I consider the passage of the stone to be chiefly interrupted by a spasmodic constriction of the ducts, I have employed opium for taking off this with great advantage.

Similar circumstances have frequently occurred in the case of urinary calculi passing the ureters, in which I have found it necessary to employ opium and blood-letting at the same time.

In like manner, as opium is useful in moderating excretions; so where the irritation occasions an increase of these excretions, which is attended with affections which irritate the whole system, opium becomes especially useful. Hence it becomes so generally useful in catarrhal affections, and the cough attending them; and probably it is this analogy that has brought the use of opium to be frequently employed in pneumonic inflammations. It is possible that there may be cases of such inflammations wherein the opium may be more useful in taking off the cough, than hurtful by aggravating the inflammatory state of the system; but I have hardly met with such cases. And even in the recent state of catarrhs from cold, I have found the early use of opium manifestly hurtful: and in cases of pneumonic inflammation I have always found it to be very much so, if exhibited before the violence of the disease had been moderated by repeated blood-letting.

When that indeed has been done, I have found the opium very useful in quieting the cough; and I have hardly ever found it hurtful by stopping expectoration. It may suspend this for some hours; but if the glands of the bronchia have been duly relaxed by bleeding and blistering, the expectoration after the use of opium always returns with more advantage than before. The mucus which had issued before had been poured out from the follicles in an acrid state; but, by being made to stagnate, it becomes milder, and is discharged in what the ancients called a *Concocted State*, with more relief to the lungs.

Although we are well persuaded that opium, when it does not procure sweat, is always hurtful in inflammatory diseases; yet I am ready to admit, that when it is directed to procure sweat, it may be so managed as to take off the inflammatory disposition of the system, and thereby to cure the most part of inflammatory affections. This we certainly learn from the present practice in acute rheumatism, which is often cured by a sweat excited by *Dover's* powder. We consider the disease to be purely of the inflammatory kind, and attended with every mark of inflammatory disposition: and therefore, when opium, in this disease, is given for the purpose only of relieving pain and giving sleep, we have found it constantly hurtful: but we have always found, that sweating with *Dover's* powder was the most effectual means of taking off the whole of the disease.

Before dismissing the consideration of the use of opium in inflammatory diseases, I must observe, that there is a certain state of these in which I judge it to be not only admissible, but often very useful. This is in the suppurating state of inflammation; and, as soon as a determination to this has taken place, we suppose the phlogistic diathesis of the system to be very much taken off, and therefore that the pain of suppuration may be safely relieved by opium; as we are at the same time persuaded that opium promotes the process of suppuration.

The next set of diseases in which I am to take notice of the use of opium, are the Exanthemata: and I begin with observing, that as, in all of these it may be supposed there is an acrimony diffused over the whole system, and giving some irritation to it; so we are of opinion, that opium, by moderating this irritation, may in general be useful; and that therefore it is often more admissible than their other circumstances might seem to allow.

But, to be more particular, the use of opium, in the small-pox has, since the time of *Sydenham*, been very much spoken of. In the inflammatory state of the eruptive fever, I have always found opium to be hurtful: but as soon as the disease has taken a determination to suppuration, I have always found it employed with advantage. As I had occasion to practice in this disease long before the use of inoculation became common in this country, I always found the practice of *Sydenham*, in giving an opiate once or twice a-day, to be extremely useful, especially when, at the same time, much costiveness was prevented by the use of laxative glysters. Since the practice of inoculation became more common, and that by the several means employed, few pustules are produced, I hold the employment of opiates to be unnecessary and superfluous: but when it happens, even after inoculation, that a numerous set of pustules are produced on the face, I still hold the employment of opiates to be extremely proper: and when, either in consequence of common infection or of in-

oculation, a confluent small-pox is produced, which is always attended with a low and putrid fever, I hold opium to be one of the most effectual means of supporting the vigour of the system, and of producing as much of a kindly suppuration as the nature of the disease will admit of. In short, I hold opium to be a very useful medicine in various circumstances of the small-pox: but I would not assert its absolute utility to be so great, as the late *Dr. de Haen*, from his enmity to inoculation, has been led to maintain.

The affinity that was so long supposed to take place between the small-pox and measles, formerly led practitioners to transfer the practice found useful in the one, to that of the other; and I suspect that even *Dr. Sydenham* was under this influence in recommending so strongly as he has done the use of opiates in the measles.

The measles, however, is purely, and often strongly, an inflammatory disease, with a strong tendency to pneumonic inflammation: and I believe that the most part of practitioners find blood-letting to be the most certain means of obviating the fatal consequences of this disease. In many cases, therefore, of measles, before bleeding had been duly employed, I have found opium not only to be ineffectual, but manifestly hurtful. It is true, indeed, that the measles are very constantly attended with a cough, for which the only certain remedy is opium: and as this symptom is not only severe, but may be supposed to aggravate the disease, the practitioner has a strong temptation to employ opium; and I am of opinion that it may be employed more freely than the inflammatory nature of the disease might seem to admit of. I would, however, have practitioners, from what I have said above on the use of opium in pneumonic inflammation, and now on the present subject, be as much as possible reserved in the use of opium in the measles, till the violence of the inflammatory state be taken off by bleeding and other antiphlogistic measures.

With respect to the use of opium in other exanthemata, I have little to say. When the simple scarlatina, and even the scarlatina anginosa, is purely inflammatory, without any tendency to a putrid state, I judge opium to be an unnecessary remedy; and when the scarlatina anginosa is of the putrid kind, I am persuaded that opium may be pernicious.

The next order of diseases to be taken notice of, in which opium may be employed, is that of hæmorrhagies. From the manifest power of opium in restraining evacuations, an analogy has transferred the use of it to hæmorrhagies; and both materia medica and practical writers have commended its use in such cases; but we are persuaded that there is much fallacy in the testimonies that have been given of its good effects. We are well persuaded, that every active hæmorrhagy is accompanied with a phlogistic diathesis of the system; of which we have just now said enough to show, that in such cases opium is generally hurt-

ful: and I have had several occasions in active hæmorrhagies to observe its being so. If opium, therefore, is ever admissible or useful in such cases, it must be in those in which the hæmorrhagy is occasioned and supported by a particular irritation. Thus, in a hæmoptysis, where the blood comes up without coughing, or when the cough attending it only arises in consequence of blood being poured out into the bronchia, as in cases of hæmoptysis from external violence, opium is of no service, and often does harm. But there are cases in which the hæmoptysis is occasioned by coughing, and appears only in consequence of the returns of coughing: in which cases opium may, and has been of service.

In the mænorrhagia which happens to women who are not pregnant, I have not found opium of service: but in the cases of abortion and of child-bearing, the hæmorrhagy very often depends upon spasmodic affections; in quieting of which opium may be highly useful.

There is no disease in which opium has been more frequently employed, or found more useful, than in catarrhal affections. These very often depend upon an undue balance of the system, that is, upon a languid perspiration, necessarily producing a more copious determination of the lungs; and this, as pouring out a mucus, is attended with much coughing. In many persons this is habitual, or is readily renewed upon every slight application of cold; and in such cases and persons, opium is a sovereign remedy. Whenever, therefore, there is little fever and much coughing, it may be employed very freely, that is, in doses which have sedative effects without heating the system. The peculiar delicacy and irritability which occurred in *Dr. G. Young*, does not allow of his experience being admitted in forming any general rules.

The remarks I have now made, relate especially to habitual catarrhs: but there is a catarrh arising occasionally only from a strong application of cold, almost always attended with a phlogistic diathesis of the system, and probably with a more or less inflammatory state of the mucous glands of the bronchia. Such a disease is to be cured by blood-letting, and an antiphlogistic regimen: and the early use of opium, by confirming the inflammatory state, has proved very hurtful. What I have said above, upon the management of the cough, in cases of pneumonic inflammation, is entirely applicable here, and should correct an abuse that has been too common and very mischievous.

Another profluvium in which opium has been much employed, is the dysentery; the nature of which, till very lately, has been very little understood. If I am right in the pathology I have elsewhere endeavoured to establish, it will be obvious, that if the present practice of the frequent use of gentle laxatives be the most effectual measure, it will be equally evident that opiates must be commonly hurtful; and notwithstanding the urgency of pain, it is at best a very precarious remedy, and to be avoided as

much as possible. This, however, seems now to be so well understood by our practitioners, that there is no occasion for my insisting longer on it here.

I have now considered the use of opium in all those cases in which it is most nice and difficult, that is, in all the various diseases of the febrile kind; and with respect to others, our work will be more easy.

In the cotomase diseases, it is obvious that opium can hardly in any case be admissible. In some cases of palsy, attended with convulsive motions, I have known it employed, and with success, in relieving those motions, but manifestly, at the same time, aggravating the primary disease.

In dyspepsia and hypochondriasis, there often happens pains and spasmodic symptoms, which may be, and for the most part are, relieved by opium. It is accordingly often employed, and it is not easily withheld from such patients; but I have always found the frequent use of opiates in these diseases extremely pernicious.

It is by preserving the mobility of the energy of the brain, especially in spasmodic affections of an idiopathic kind, that opium has discovered its great powers. In the most violent and obstinate disease of this kind, the tetanus, opium, though often insufficient, has however been the most effectual remedy; and it appears that, whatever other remedies have been proposed and alleged to be useful, hardly any of them have been so but when opium was at the same time employed. But I say no more on this subject, as I expect the enquiries that the *Société Royale* of Paris are now engaged in, will give us some more light on this subject: and I must also refer to the works of that learned society, for our best instruction on the use of opium in the hydrophobia.

In various convulsive affections of the limbs, not accompanied with any stupor, and therefore not to be considered as epileptic, we have frequently found opium of service; but it is not always so: and as I cannot always in different cases assign the causes, or distinguish them by different circumstances; so I cannot determine the cases in which it is especially proper.

There is a case which I think may be distinguished from all others, which is generally known under the title of Chorea Sti. Viti. Neither the pathology or practice in this disease is well agreed on among physicians: and we cannot enter into the discussion here; but can say, from a good deal of experience, that opiates have been very generally useful in the cure of it.

On this subject of convulsive diseases, the great question with regard to the use of opium has occurred with respect to epilepsy; and it has been variously determined by different authors. The pathology of the disease is in many respects obscure: but we can clearly enough perceive that it arises from different conditions of the system; and so far as we can discern and distinguish these,

we may make some attempts towards ascertaining in what cases of epilepsy opium may be hurtful, and in which it may be useful.

To this purpose, we can observe that it may be produced by large hæmorrhagies, or other causes of great debility: but as I have hardly ever met with cases of this kind, I cannot say how far opium may be useful in them.

Much more frequently do we meet with epilepsy connected with a plethoric state of the system: and in all such cases I am of opinion with the most part of practitioners, that opium is extremely hurtful. So far does a phlethoric state appear to me to dispose to this disease, that I am of opinion with *Dr. Cheyne*, that epilepsies have been more frequently cured by a low diet than by any other means. It is here to be observed, that epileptic fits very frequently occur from an occasional turgescence of the blood in the vessels of the brain: and from frequent trials, I know that opium will not prevent such fits; but, if exhibited, will bring them on with more violence.

They are the epilepsies arising from irritation applied to the nervous system, in which opium promises to be useful: and when the return of such fits are anywise periodical, or nearly so, opium given a little before the times of accession, has been often useful in preventing the recurrence. In many instances, however, the returns of epilepsy are irregular; and in such cases, the frequent use of opium, either by producing an occasional turgescence of the blood, or by increasing the mobility of the system, is often very hurtful.

As instances of epilepsy depending upon irritation applied to the nervous system, I consider all those depending upon an *aura epileptica* to be such: and in several cases of this kind, where the times of accession could be foreseen, and even when the symptoms announcing it had come on, I have found opium an effectual remedy.

The late *Dr. de Haen* has given us what seems to be a singular case of epilepsy, as occurring only in time of sleep, and when the recurrence of the fit was prevented by avoiding sleep: but at the same time this very disease was cured by the use of opium. This, as I have said, may seem singular: but it is not so much so as might at first sight appear: for perhaps the greatest number of the cases of epilepsy occur during the night, and during sleep. In several such cases, I have now frequently found an opiate, given at bed-time, prevent their return.

I have thus treated of the use of opium in the spasmodic affections of the animal functions, and of those of the vital. I have to mention only those of the heart in palpitation, and those of the lungs in asthma and chincough.

Palpitation is generally a symptomatic affection; and so far as it depends upon spasmodic affections, if the primary disease admits of opium, the symptom of palpitation may be cured by it also.

In the case of asthma, when the disease depends, as it often

does, upon occasional turgescence of the blood in the lungs, opium can hardly be employed with safety; but when it depends upon other irritations, and is purely of the spasmodic kind, opium may be employed both to prevent and to moderate fits, with great advantage. Even when the disease is of the catarrhal kind, if it be fit to employ opium to relieve the catarrh, it may likewise be employed to relieve the asthma depending upon it. But I must conclude by remarking, that in both the spasmodic and catarrhal asthma, I have frequently employed opium in moderating the disease; but have never found it to prove an entire cure of it.

With respect to the chincough, we have to observe, that in the first stage of it, and especially when that is attended with fever and difficulty of breathing, opium has always appeared to me very hurtful. But when the disease had subsisted for some time, and is in what I call its second stage, and when the fits come most frequently in the night time, I have found opium of great use; and as I judge, it has often contributed to put an end to the disease.

In the spasmodic affections affecting the natural functions, opium may have much employment. The pyrosis, frequent in this country under the name of the Water-Brash, and frequent in most countries of Europe, as a transitory illness, has been little taken notice of by physicians; but it is a painful disorder, and a relief from it is often demanded. We have found nothing that gives that relief excepting opium: but this relieves only the present fit, and contributes nothing to preventing returns of it.

In colic, the employment of opium is not exactly agreed on. It will pretty certainly relieve the pain for some time; but if the colic has been brought on, or is attended by costiveness, it will certainly confirm the disease, and interrupt the operation of the purgatives, which are absolutely necessary to the cure of it. Opium, however, is certainly suited to the cure of every spasmodic affection: and if it can be employed so as not to interfere with the operation of purgatives, it may as an antispasmodic even favour the operation of these, and contribute to the cure of certain cases of colic. For this purpose, some practitioners have exhibited the opium and the purgative at the same time. But this has been seldom found to answer: and it has always appeared better, in the urgency of pain, to exhibit the opiate by itself; and in four, five, or six hours after, when the power of it was somewhat diminished, to exhibit the purgative. In this manner of managing, it is commonly necessary to employ a purgative of a powerful kind, and one that commonly operates soon after its exhibition; and these considerations will, on the one hand, exclude the employment of aloetics, and, on the other, recommend the *oleum ricini*.

In affections of the alimentary canal, of a nature contrary to that of colic, that is, where the action of the canal is preternaturally increased, as in vomiting, cholera, and diarrhœa, opium is a more undoubted remedy.

Vomiting is commonly a symptomatic affection, from very various causes ; and in many cases cannot be cured by opium : but the distinction of these cases cannot be entered into here ; and I have only to observe, that there are more cases of it than is commonly imagined to be relieved by opium properly employed.

It is common with practitioners to exhibit the opium by the mouth : and it is often in such cases immediately rejected again by vomiting, without having any effect in relieving the disease ; which must always render the practitioner uncertain to what quantity it may be necessary to repeat the opiate. In all such cases, when the vomiting is not immediately stopped by the opiate given, and this is rejected by vomiting, it is extremely improper to repeat it in the same manner : and a much surer measure is to throw the opium, joined with a small bulk of a mild liquid, into the anus ; and when thus thrown in, in sufficient quantity, it will as certainly stop the vomiting as if it had been thrown into the stomach itself.

In cholera, the employment of opium, as directed by *Sydenham*, is so well understood, that we need not say any thing of it here : and I go on to speak of its use in diarrhœa, in which it has not been so frequent as we judge it ought to be.

As diarrhœa seems always to depend upon an increased action of the intestines, so, except in a few singular instances in which opium proved purgative, we have found it very universally to have the power of diminishing, and for some time suspending, the action of the intestines ; and therefore very universally of use in the diarrhœa. This indeed may sometimes be a symptomatic affection, and therefore not to be entirely cured by opiates ; and sometimes the disease may depend upon an acrimony which must be evacuated in order to the entire cure of the disease. But still in most cases it seems to be safely employed : for as its operation is not very durable, it will not long interfere with the use of other remedies that may be thought necessary ; and it seldom happens that the temporary suspension of the diarrhœa is of any bad consequence. In many cases we have found purgatives to be very hurtful, and the disease to be more quickly cured by the continued use of opium alone.

There is no disease in which opium has been more frequently spoken of as a remedy than in hysteric affections : but there is nothing I find more difficult to treat of in a scientific manner.

The term *Hysteria* I would willingly confine to the affection which I have described under that title in my *First Lines* ; but most writers are disposed to extend the meaning of it much farther, and to every unusual feeling, or irregular motion, that seems to arise from a mobility of the nervous system. To give any due limits to this idea of hysteria, I find beyond the reach of my skill, and shall not attempt it here : and with respect to my present subject, can only say, that in hysteria, as I would define it, and

as generally affecting plethoric habits, and depending upon an occasional turgescence of the genital system, I hold opium to be an improper, and commonly a hurtful remedy.

But, on the other hand, in all those cases of unusual feeling and irregular motions, not depending upon a plethoric state, but manifestly upon a mobility of the nervous system, opium is a very certain remedy. Whenever, therefore, these symptoms are in excess, it may be employed, tho' it be difficult to set the proper limits to its use. There are cases in which its tonic and antispasmodic powers must be frequently repeated: but it is to be remarked, that wherever that necessity does not manifestly occur, the frequent use of it increases the mobility of the system, and creates a seeming necessity that readily induces a habit, which again, constantly indulged, has a tendency to destroy the system altogether.

In the rabies canina, and in the most violent state of it, the hydrophobia, opium has been employed. But the experiments reported have not been so many as to fix our judgement on this subject; and for what may be said upon it, I must refer my readers to the labours of the learned and industrious *Société Royale* in Paris, who have taken much pains, and employed the most proper means for ascertaining the practice in this disease.

In mania, the employment of opium is nice and difficult. In the appendix to *Wepfer's Historia Apoplecticorum*, we have an account of mania being cured by large doses of opium; and it may be true. But there is no such account of those cases as might serve to specify their peculiar character, so as to enable us to imitate the practice, whilst we know pretty certainly that there are other cases which do not admit of the same.

In several cases of mania we have employed opium; and in some have found it useful in moderating the violence of the disease: but in other cases we have found it manifestly hurtful: and we have not had so many opportunities of treating the disease as to allow us to distinguish clearly the cases in which it may be proper. We suppose there are many cases of the disease depending upon an organic affection of the brain, in which no benefit is to be expected from opium. But there are certainly many other cases, in which, from their transitory nature, we cannot suppose any such organic affection, and in which therefore opium may be admissible and useful.

If we may suppose that such cases depend upon occasional causes of excitement without inflammation, we should judge opium to be a promising remedy: but probably it must be given in larger doses than we commonly exhibit, and possibly in such large doses as *Bernard Huet* actually employed. In some trials we have found it moderate the disease, and induce sleep: but I have never pushed it so far as to obtain an entire cure; because I suspected that in many cases the disease approached so much to a phrenitis as to render the large use of opium very dangerous.

We cannot indeed treat this subject with so much precision as were to be wished. But other practitioners, having more opportunities of practice, by considering what I have said both here and above on the subject of delirium in fevers, may settle this matter more exactly.

There is now but one other disease in which the use of opium is to be mentioned; and with respect to which our opinion will be expected: this is the venereal disease, in which of late opium has been very much employed, and with various success. We do not think it necessary to give an account of the different facts reported, and of the different opinions entertained, on this subject, as they are to be found in many books which are in every body's hands: and all that seems to be incumbent on me, is to say what I have learned from my own experience, and from that of my fellow-practitioners in Scotland. From this we have not learned that opium alone has been a remedy for the venereal disease. And any experiments that we know to have been made, lead us to conclude, that it is never alone sufficient for that purpose. But from almost every experiment made, we are well assured of its being of great use in almost every circumstance of the disease. It moderates and alleviates every symptom: and in many of them it will do this without the assistance of other remedies.

We are well persuaded that it will almost in every case favour and expedite the effects of mercury, either in removing symptoms or in entirely curing the disease. We have only further to remark, that the opium in this case seems to operate by obviating the effects of the general acrimony in the system: and this supposition explains both why large doses of the opium are necessary, and why persons bear these large doses in this disease better than in many other cases.

The effects of opium hitherto mentioned are for the most part such as appear in consequence of its being given by the mouth; but we have also had occasion to say, that it may be introduced by the anus into the intestines. And it is proper to remark, that not only in the case of vomiting, but also in many others, it may be introduced in this way into the intestines, and in this way produce all the effects that have been mentioned of its being thrown into the stomach. In some persons there is a peculiar irritability of the stomach with respect to opium, and from whence several disorders arise, which are avoided by its being thrown into the rectum.

Some practitioners are of opinion, that some effects of opium upon the nervous system in general, as headach and vomiting, which often appear in the morning after a dose of opium had been thrown into the stomach over night, are not so ready to appear after its being thrown into the rectum. But this seems to depend upon the dose in the latter case being weaker, either from

the quantity employed, or from the lesser sensibility of the rectum. This leads to observe, that the sensibility of the rectum is so much less than that of the stomach, that it is commonly necessary, when applied to the former, to employ at least double the quantity of what would have been sufficient for the latter.

In the application of opium to the rectum, it is necessary to introduce it in a liquid form, to avoid giving along with it any thing that may in the least prove irritating to the rectum; and therefore a solution in water is the most convenient to be employed in this way. This is farther to be observed, that we are sometimes disappointed in this practice by the opiate glyster's being rejected soon after it has been given. Hence it is as improper to throw it into the rectum in some cases of diarrhœa and tenesmus, as we said above it was improper in the case of vomiting to throw it into the stomach. But even though neither diarrhœa nor tenesmus be present, opiate glysters are sometimes rejected soon after they have been given. This perhaps may be owing to a peculiar irritability of the rectum in certain persons; but we have found it commonly owing to too great a bulk of liquid being thrown into it; and therefore I advise that opiate glysters be never made of more bulk than that of three, or at most four, ounces of liquid, and this, as we have said, of a very mild kind. I find that three drachms of gum arabic, dissolved in three ounces of water, make a proper and ready preparation for that purpose.

We must now add, that opium may be employed not only by being thrown into the stomach or into the rectum, but may also by being applied to the skin. In this case, as opium acts always first, as I have said above, upon the parts to which it is immediately applied, so it may be often applied to the external parts with some advantage; and, by diminishing the sensibility of these parts, it may relieve the pain that happens to affect them. We find also, that opium operates not only on the parts to which it is immediately applied, but that without being communicated to the sensorium, it operates to a certain extent on the nerves of the parts adjoining to that which it is more immediately applied to, in diminishing their sensibility, and thereby in relieving their pains. Thus a plaster of opium applied to the temple has often relieved the toothach. In other cases, when it is applied to the skin, whether it penetrates by inorganic pores to the viscera of the abdomen, or if it only acts on the teguments, and particularly on the muscles consenting with the viscera, we would not confidently determine; but we have certainly found the external application relieve the pains and spasms of the stomach and intestines.

The external application has been made under different forms, and I believe it may have effects either in the form of plaster or poultice: but we are very certain that its effects are most considerable when applied in a liquid form. In this form it may be employed as dissolved in water, wine or spirit: but we presume

that it will always be most effectual when dissolved in rectified spirit. This certainly most powerfully extracts the volatile part of opium, upon which its powers especially depend: and this same volatile part may be presumed to be the most readily penetrating, and therefore the most fit for external use.

After thus endeavouring to assign the various powers and virtues of opium, we must, in the next place, say somewhat of its pharmaceutical treatment and exhibition. The former has been very various, and very little upon scientific grounds. We know of no means that can be employed in operating upon the opium alone that can improve its virtues. The volatile and active parts of it may be extracted from the other parts of its substance by rectified spirit of wine; but the tincture and extract made by this menstruum has the same powers and virtues as the entire opium, and only differs by being brought into a smaller bulk. It is at the same time found, that these preparations are more offensive to the stomach than the entire opium, and are therefore very little employed. The other menstrua, as a proof-spirit, wine, and water, that may be employed in extracting opium, do it all of them on much the same footing, extracting both the gummy and resinous parts; so that the several tinctures do not differ but in proportion to the quantities employed. In all of them the qualities are the same as those of the entire opium, with a very little difference from the solid or liquid form; the former in certain cases of irritability in the stomach, being readier to sit upon it than the latter.

As opium may do ill as well as good, physicians have thought of correcting its bad qualities; but as they are not separable from its good, the business of correction has been to no purpose. From the notion of the ancients with respect to its coldness, the correction has been attempted, by the joining with it aromatic and heating medicines, which was very anciently practised, and has in some measure been continued to the present time. Some practitioners are of opinion, that the addition of aromatics renders opium more agreeable to the stomach: and we dare not assert that this does not, in some cases, take place: but we have hardly ever observed it: and we are very certain that the saffron and aromatics which are added to our thebaic tinctures, in the quantity they are employed, can neither do good nor ill. Both the colleges of London and Edinburgh have now omitted all additions to the tincture of opium: but both of them have retained the elixir paregoricum; which, either in the choice or proportion of its ingredients, I cannot perceive to have any other meaning than that of giving a variety of formula. Other attempts to correct opium have been equally fruitless; and the correction supposed to be obtained, has amounted to no more than a weakening of its power, without producing any change in its qualities. Some means of weakening its power may be readily found, particularly such practices as give occasion to the dissipa-

tion of its most volatile parts. Such is the making of the extractum thebaicum of the London college, in consequence of a solution in water; and in the bringing this into the form of an extract, so much heat is employed as occasions the dissipation mentioned. But here I maintain there is no change in the qualities of the opium, and the only change effected consists in the weakening of its power; so that two grains of this is necessary to produce the effects of one grain of the crude opium of the same quality that was employed in the preparation. Another means of weakening the powers of opium, is the application of acids; and we have found this very effectual: but it does not change the qualities; for, when given in a sufficient dose, it has all the same effects as the crude opium.

We know but one kind of addition that can be made to opium with the effect of modifying its operation; and this is the addition of emetics and neutral salts, which is done in making *Dover's* powder. In this ipecacuanha has been constantly employed: and it has been supposed that it has a specific power of diminishing the power of opium; as in that powder larger doses of opium can be employed than would be proper in the use of opium alone. This opinion, however, of the power of ipecacuanha with respect to opium, we cannot admit of; as we suppose that the large doses of opium, which are given in *Dover's* powder, become safe only because, by the other ingredients, it is directed to sweat. This we take to be the effect of ipecacuanha; not by any specific, but by its emetic power, for we can obtain the same effect by antimonial emetics; for by these, as well as by ipecacuanha, we can be allowed to employ larger doses of opium than we could of opium alone.

It certainly belongs to a treatise on the virtues of opium, to explain and ascertain the virtues of *Dover's* powder: and I have mentioned some of them above, when speaking of the use of it in intermittent fevers, in rheumatism, and in dysentery: and I leave the farther use of it to be learned by an analogy from those cases. We have only to add, that wherever the *Dover's* powder is to be employed, the effects and benefits of it will depend very much upon a proper administration which we have very often observed to be neglected or mistaken; and therefore we subjoin here what I have learned from such experience to be the most proper management of it.

The powder is to be given in the morning when the ordinary sleep or the time of it is over. Sleeping is not incompatible with, but is commonly not favourable to, sweating.

For security against cold, the patient is to be laid in woollen, that is, in a flannel shirt and in blankets, the bed-linen being entirely removed.

The powder will be taken most properly by being made into a bolus with a little syrup, and swallowed in a wafer, that the taste of it may not occasion any squeamishness.

The covering on the body may be only what the person has been used to sleep in. But commonly it will be convenient to make some addition over the whole body, and always some considerable addition upon the feet and legs.

As the powder is ready to be thrown up by vomiting, no drink should be taken into the stomach till some sweat breaks out.

When the sweat begins to break out, the person may then take frequently, but at first in small portions, some warm liquid, such as thin gruel, weak sage, or bohea tea; and of such drinks he should take frequently during the course of the sweating.

When the sweat has broken out, if it does not extend freely to the legs and feet, some additional covering should be laid over those parts, or boiled bricks or bottles filled with warm water be laid to the soles of his feet; for it is always proper to render the sweating thus universal.

As the sweat should be carried on with as little heat and uneasiness to the person as possible, if he finds himself very warm and restless, the additional covering that was put upon the body, and even a part of that put upon the feet and legs, may be gradually removed.

If the person bears the sweating easily, it is of much consequence to continue it for some length of time, and always, if possible, for twelve hours. Then it will be allowable to let it cease, by drying the body very well with warm towels, and shifting the body into dry flannels and blankets, and allowing him afterwards to put out his hands, and perhaps his arms, from under the bed-clothes. But he should continue in flannel and blankets till next morning.

During the sweating, instead of the drinks above mentioned, he may take frequently a weak soup, as chicken broth, or what we call beef-tea: and at his ordinary time of meals, he may take some dry toast with these broths: or if the sweat does not proceed freely, and it is at the same time not attended with much warmth, he may, instead of the drinks mentioned, take frequently weak negus or white-wine whey.

In the morning after this sweating, the person may come out of bed, and put on his linen, and other parts of his ordinary dress; but should keep his chamber, or at least within doors, for the whole day after; and even for a day or two after that, he should be very careful to avoid being exposed to cold.

By this administration I have found the *Dover's* powder a highly useful remedy.

With respect to the exhibition of opium, we have sometimes found a small dose of it answer the purpose; as, in the gradual use of opium and of wine, the stimulant power is first exerted, so small doses are ready to prove stimulant rather than sedative: but for obtaining the latter effect, it is commonly necessary to give a full dose. This at a medium, for adults, is at least one grain: And I am a little surprised at *Bergius* putting the

mean dose at half a grain, and at *Tralle's* telling us that he never goes beyond a grain. Both such accounts show me, that they do not use opium freely either in Sweden or Silesia. We find it often safe and proper to give more than a grain; and whenever there is any irritation in the system to be overcome, it is commonly necessary to go still farther. In all cases it may be proper to begin with moderate doses; but where these do not answer the purpose, they must be repeated and increased till the desired effect is obtained: and we very often find that may be increased with safety to a very high degree. In a case of the gout in the stomach, I have by degrees gone to the dose of ten grains twice a day; and when the disease was overcome, the dose of opium was gradually diminished, till in the course of two or three weeks it was none at all: and in all this no harm appeared to be done to the system. We frequently find, that when a strong irritation is to be overcome, very large doses may be given without procuring sleep or showing any of those deleterious effects that in other cases appear from much smaller quantities given. All this appears from the practice now well known in tetanus, mania, small-pox, gout, and syphilis.

In the use of opium, it is to be constantly observed, that in the case of irritation, when large and repeated doses are necessary, even the effects of such doses do not long continue; and therefore, that the repetitions must be made at no long intervals. We have frequently observed in such cases, that the effects of opium do not continue longer than eight hours: and that, after such an interval, if the disease has not yielded to former exhibitions, a repetition becomes necessary. It is hardly requisite to repeat here what we have said above, of narcotics in general, that opium is subjected to that law of custom by which the force of impressions in which the body is passive becomes weaker by repetition; and that, when frequent repetitions are requisite, it is always necessary to increase the dose.

CICUTA.

There are many instances of the fallacy of experience in matters of the materia medica: but there is no instance in which it appears more strongly than in the history of our present subject. Since *Dr. Storck* recommended it from his own experience as a most effectual remedy in many diseases, it has been employed by many practitioners in every part of Europe; and taking in the whole of the reports we have had, I am still at a loss to say what are truly the virtues and powers of this plant. I am disposed to think that the worthy *Baron Storck*, from a partiality to his own discovery, and from much false information given in complaisance and adulation to the rank he holds, has represented the virtues of hemlock as much greater than ever they were, or ever will be found to be. And many are the instances in which practitioners of the greatest candour and discernment have found this medicine to fall much short of the promises which *Baron Storck*

had given of it. For experiments directly contradictory to those of Baron *Storck*, we would not induce the testimonies of a declared enemy, and of a man of the most difficult access to all new opinions and remedies, the late *Dr. de Haen*. But we have no reason to reject the testimony of persons not suspected of partiality: and, in the particular case of cancers, we have the experiments of *Petrus Af. Bierken*, as reported by *Bergius*, which assert, that the cicuta not only fails in the cure of cancers, but that it aggravates the disease, and hastens on the fatal event of it. In the other instances seemingly contradicting the assertions of Baron *Storck*, we consider many of them as merely instances of failure of what Baron *Storck* had led to expect: but such negatives do not allow them to afford any conclusion. I know from my own observation, that many of the trials had been unfairly made. Sometimes the proper plant had not been employed, and frequently it had been improperly prepared. I have frequently found the extract, both as prepared at Vienna and here at home, a perfectly inert substance, and producing no sensible effects on the body, though given in very large quantities. The nicety of *Dr. Morris*, in distinguishing the extracts of different places, seems to depend upon the general fallacy attending this preparation. What this is owing to we cannot clearly determine. But such is the uncertainty of extracts of the cicuta, that the practitioners of this country have very universally deserted the use of that preparation; and when they think of employing this plant, they always employ it in powder. This indeed is commonly more to be depended upon than the extract: but the powder also, from improper drying or keeping is liable to uncertainty, and we have frequently found it in a perfectly inert state.

In illustration of all this I give a particular history: A lady labouring under a cancer in the breast, was advised to use the cicuta: and she accordingly got a quantity of it in powder, and weighed out the doses of it herself. She began with a small dose; and feeling no sensible effects from that, she went on increasing the dose till she had taken a drachm for a dose. By the time she had come to this size of dose, she had taken the whole of the parcel she had got from the apothecary, and therefore sent to him for a fresh parcel of the powder. She had, however, been advised, that when she was to pass from one parcel to another, she should suspect some inequality in the different parcels; and therefore, though she had taken a former parcel in a very large dose, she should begin any fresh parcel with a small dose only. Upon this occasion, therefore, she was resolved to follow this advice: and as she had taken sixty grains of the former, she would take twenty only of the new parcel: but such was the inequality of the two parcels, that she was nearly killed by the twenty grains she had then taken. In ten or fifteen minutes after she had taken the dose, she was affected with

sickness, tremor, giddiness, delirium and convulsions. Happily for her the sickness proceeded to a vomiting with which part of the powder was thrown up: but the vomiting continued, and probably till the whole was thrown out: and notwithstanding this, the delirium, and even the convulsions, continued for some hours after. These symptoms, however, gradually abating, a sleep at length came on; and after some hours she awaked, free from all the former symptoms. This shows sufficiently the unequal state of the hemlock in powder. The same powder in the quantity of five or six grains only occasioned some tremor and giddiness, the former parcel taken to sixty grains had no sensible effects at all. I hold it as a rule, that when hemlock, either in the form of powder or extract, has no sensible effects when taken to twenty grains for a dose, the medicine may be supposed to be imperfect; and that if it is to be continued, another parcel of it should be employed.

From what has been said, it will sufficiently appear, that the many failures that have been reported of hemlock, do not afford any proof of its being useless as a medicine; and as it has manifestly strong powers in affecting the human system, I conclude that, like all other substances possessed of such powers, it may be a very efficacious medicine. This, we believe, will be allowed: but it may still be a question, in what diseases and cases of them it may be of peculiar efficacy? Here I am at a loss, from my own experience or that of others, to answer this question. We have known it useful in resolving and discussing schirrosities of different kinds, and particularly those of a scrophulous nature. We have also known it useful in healing ulcers which had come upon schirrous tumours, and which continued to be surrounded with such schirrosity; and in some ulcers certainly that approached to the nature of cancer. Even in cases that might certainly be considered as truly cancerous, I am so far from being of the opinion of *Bierken* of its rather aggravating the disease, that I have found it in several cases to relieve the pain and mend the quality of the matter proceeding from the sore, and even to make a considerable approach towards healing it; though I must own that I never was concerned in a cancerous case in which the cure of the sore was completed.

This medicine has been by many reported as useful in syphilis: and one of the most competent judges on this subject, *Mr. John Hunter*, has found it to be so. I myself have employed it in some cases with advantage: but in several others I have not found any benefit from its use. The ancients were of opinion that it diminished the venereal appetite. But *Bergius* thinks it has a contrary effect, and mentions a case in which it had restored the power of venery when it had been lost: but so far as my observation goes, there is no foundation for either the one or the other opinion.

I have said above, that it often fails from its being exhibited

in an inert state, and that it can only succeed when it shows some sensible effects on the system. But candour obliges me to acknowledge, that in many cases where it did show sensible effects, it failed in curing a disease, though similar to those in which it had succeeded; and I am yet at a loss to ascertain the cases to which it is most certainly adapted.

With respect to the pharmaceutic treatment of hemlock, there are different opinions concerning the proper time of gathering the plant. We have been in use here to gather it before the flowers, and even almost before the flower-bearing stalks appear: and from some experiments we have been led to judge, that at this period of its growth, the virtues of the hemlock are the strongest. *Dr. Fothergill* was of opinion that these virtues were stronger at a more advanced period, when the flowers were falling off, and the seeds beginning to be formed: and if we understand *Bergius* rightly, he seems to be for allowing the growth to proceed still farther, and till the seeds are ready to fall off. We must leave it to farther experience to determine this matter more exactly, though I believe it is of little consequence which ever of the practices be followed.

We have for the most part employed the leaves of the plant. But a physician, lately of this place, was strongly persuaded that the seeds, treated by decoction, and brought into the form of an extract, gave a preparation more powerful than that made of the leaves; and therefore gave occasion for such an extract to be introduced into our dispensatory. But this property of the seeds I have not had confirmed by my own observations, and must think it succeeded no better with the other fellows of the college, as we do not find that such a preparation continues to be made.

We have observed above, that both the extract and the powder are liable to be in an imperfect state: and we have not attempted to assign the causes of this; but must earnestly recommend it to the apothecary to find out those causes, that they may be avoided: and to engage his attention to this matter, we must repeat what has been said above, that unless the hemlock produces sensible effects on the nervous system, it cannot be a remedy in any disease; and we are disposed to add, that those effects must be pretty strong, in order to render the hemlock an efficacious medicine. The practitioner, indeed, should take care, by bringing on these effects by degrees, to avoid its becoming a poison. But it is to be suspected, that by bringing on the effects too slowly, the medicine fails in many cases; and by its being gradually habituated to the system, that it has less effect than it might otherwise have had.

Baron Storck is very fond of representing the hemlock as a very innocent medicine: and we have known it taken for a very great length of time without any bad effects. But I am certain it may prove a poison; and that it is only by the system being

slowly habituated to it, that it proves, as every other vegetable poison may be, sufficiently innocent.

In mentioning the administration, we must remark, that it is often applied externally with advantage, and particularly in the form of poultice: but in the form of plaster, in which it has been often employed, it seems to be of very little effect. In the form of poultice it has been useful in resolving some indurations, especially those of the scrophulous kind. But in the indolent schirrhosities in the breasts of women it is seldom of any service: and we have found the frequent application of hemlock poultices do much harm, by bringing these tumours sooner to an open cancer.

CICUTA VIROSA.

The root of this plant is well known to be a strong poison both to men and brute animals, with the exception of the goats and swine of Norway, which are not hurt by it. Its deleterious powers on man are so considerable, that they have prevented its being employed as an internal medicine; though with me this is not a sufficient reason for our not attempting a trial of this and some other of the umbelliferous poisons.

If it be true that both the roots and the leaves become much milder by drying, we might probably find an intermediate state between the fresh and the dry, with which our trials of this might be made with more safety. The roots of the cicuta have been much recommended as an external remedy in many cases: but as these recommendations have proceeded upon the alleged experience of a barbarous people, we cannot pay much regard to them.

BELLADONNA.

This is a medicine that has been very long known for its narcotic and deleterious powers; and from these powers it is sufficiently probable that it might be an efficacious medicine. Its berries and leaves are the parts which have been chiefly employed: the former being taken unwittingly by children, have often shown their poisonous quality. But this does not hinder us from believing that *Gesner* employed them safely as a soporiferous and anodyne medicine; and we have often resolved to imitate his practice, but have always been by certain accidents diverted from it.

It is the leaves that have of late been especially employed as a medicine: and they have been employed in powder, in infusion, and in extract from a watery infusion. The latter I have often found, like that of hemlock, to be an inert substance: but the powder and infusion of the leaves are more certainly active. They have both been especially employed in the cure of cancers: and there are many instances of their utility reported by persons of good credit: but at the same time there are as many reports of its having been employed without success; and the latter reports are sometimes from persons who had upon other occasions employed it with advantage.

The same variety of events has occurred to myself. I have had a cancer of the lip entirely cured by it. A schirrosity in a woman's breast, of such a kind as frequently proceeds to a cancer, I have found entirely discussed by the use of it. A sore a little below the eye, which had put on a cancerous appearance, was much mended by the internal use of the belladonna. But the patient having learned somewhat of the poisonous nature of the medicine, refused to continue the use of it, upon which the sore again spread and was painful; but upon a return to the use of the belladonna, was again mended to a considerable degree; when the same fears again returning, the use of it was again laid aside, and with the same consequence of the sores becoming worse. Of these alternate states, connected with the alternate use of, and abstinence from, the belladonna, there were several of these alternations which fell under my own observation; but the patient being removed to a great distance, I do not know how long these changes took place: but in the mean time, I was very well convinced of the power and virtues of the medicine in certain cases. At the same time I must own, that in several cases, both of schirrosity and of open sores, it has not answered my expectations.

I have only further to add, that the infusion of the belladonna is ready to bring on a dryness and considerable stricture of the pharynx and adjoining parts of the œsophagus. In one instance of a person using it at a distance and without any communication with me, when taking the infusion, with the effect of nearly healing up the cancer of the lip, he had this dryness and stricture come on to a great degree; and was suddenly killed by a very copious throwing up of blood, seemingly, as I was informed, proceeding from the fauces.

HYOSCIAMUS.

This is a plant which has been long well known for its narcotic and deleterious qualities; and many instances are reported of its fatal effects on man and other animals. But notwithstanding its deleterious powers it has been employed as a medicine both in ancient and modern times. The roots, the seeds, and the leaves, have all been upon occasion employed; but till very lately it was especially the seeds which were much commended for restraining hæmorrhagies of all kinds, and particularly by the excellent *Mr. Boyle*. The credit, however, of this excellent person, in reporting the virtues of medicines, for reasons I have given before, does not stand high with us. We have not tried the seeds, but have employed the extract of the leaves very often. This, like other narcotic substances, will sometimes moderate and restrain hæmorrhagies. But for the reasons we gave before on the subject of opium, we are persuaded, that, except where the hæmorrhagy manifestly depends upon a particular irritation, henbane, and all other narcotics, may be very hurtful.

The seeds for a long time past have not been employed in the practice of Britain: nor were the leaves or any preparation of

them thought of till lately, that the Baron *Storck* endeavoured to introduce the extract of the leaves. As usual with him, he gives us many cases of different diseases in which this extract had been useful: but so far as we have learned, his credit has not been supported by other practitioners.

With respect to its effects in mania, melancholia, and epilepsy, the experiments of *Greding*, reported in *Ludwig's* adversaria, are very contrary to those of Baron *Storck*. In epilepsy, and various convulsive affections for which Baron *Storck* particularly recommends the extract of henbane, we have very frequently employed it; but have never found it of any great virtue, nor of more than what we have found in opium. We have indeed found the hyosciamus to be often an agreeable anodyne and soporiferous medicine: and we have frequently found it such in persons with whom, from particular circumstances opium did not agree, and particularly because it was less binding to the belly than opium. We judge however, that it is more ready in full doses to give delirium than opium is: and therefore we have found it in many cases to give turbulent and unrefreshing sleep: and notwithstanding its laxative qualities, for which we had employed it, we have been obliged to lay it aside.

Baron *Storck*, and some other practitioners have found the extract of henbane useful in small doses; and in a few instances I have found the same: but though I always begin with the small dose of a grain or two, yet in the extracts prepared in this country we have seldom found the soporiferous or anodyne effects appear till we had proceeded to doses of eight or ten grains; and we have often found it necessary to go further, to fifteen, and even to twenty grains. We have often employed such large doses with advantage; and where they have been brought on by degrees, without any bad effects. We must, however, remark here, that it is almost only when the extract of henbane is employed in large doses that its laxative effects are very remarkable.

NICOTIANA.

This is a well-known drug, of a narcotic quality, which it discovers in all persons, even in small quantity, when first applied to them. I have known a small quantity of it, snuffed up the nose, produce giddiness, stupor, and vomiting; and when applied in different ways, in larger quantity, there are many instances of its more violent effects, even of its proving a mortal poison. In all these instances it operates in the manner of narcotics: but along with its narcotic qualities it possesses a strongly stimulant power, perhaps with respect to the whole system, but especially with respect to the stomach and intestines; so as readily, even in no great doses, to prove emetic and purgative.

By this combination of qualities, all the effects of tobacco may be explained: but I shall begin with considering all the effects as they appear in the use of it in an article of living.

As such it has been employed by snuffing, smoking, and

chewing; practices which, as having been for two hundred years past common to all Europe, need not be described here. Like other narcotics, the use of it may be introduced by degrees; so that its peculiar effects, even from large quantities employed, may not, or may hardly at all appear: but this does not at all contradict the account I have given of its quality with respect to persons unaccustomed to it, and even of its tendency to show its power to those much accustomed to it: for even in these, the power of habit has its limits; so that in persons going but a little beyond the dose to which they have been accustomed, very violent effects are sometimes produced.

On this subject it is to be remarked, that the power of habit is often unequal; so that in persons accustomed to the use of tobacco, a lesser quantity than what they had been accustomed to, will often have stronger effects than had before commonly appeared. I knew a lady who had been for more than twenty years accustomed to take snuff, and that at every time of day; but she came at length to observe, that snuffing a good deal before dinner took away her appetite: and she came at length to find, that a single pinch, taken any time before dinner, took away almost entirely her appetite for that meal. When, however, she abstained entirely from snuff before dinner, her appetite continued as usual; and after dinner, for the rest of the day, she took snuff pretty freely without any inconvenience.

This is an instance of the inequality of the power of habit in exerting its effects: but in what cases this may take place, we cannot determine, and must now go on in marking its usual and ordinary powers. When snuff, that is, tobacco in powder, is first applied to the nose, it proves a stimulus, and excites sneezing; but by repetition that effect entirely ceases.

When snuff is first employed, if it be not both in small quantity and be not thrown out immediately by sneezing, it occasions some giddiness and confusion of head. But by repetition these effects cease to be produced, and no other effect of it appears in the accustomed, when not taken beyond the accustomed quantity. But even in the accustomed, when it is taken beyond the usual quantity, it produces somewhat of the same giddiness and confusion of head that it did when first employed; and in several cases, these effects in the accustomed, depending on a larger dose, are not only more considerable, as they act on the sensorium, but as they appear also in other parts of the system, particularly in the stomach, occasioning a loss of appetite, and other symptoms of a weakened tone in that organ.

With respect to this, it is to be observed that persons who take a great deal of snuff, though they seem, from the power of habit, to escape its narcotic effect; yet as they are often liable to go to excess in the quantity taken, so they are still in danger from these effects operating in an insensible manner; and I have observed several instances of their being affected in the same manner as

persons are from the long continued use of other narcotics, such as wine and opium ; that is, by a loss of memory, by a fatuity, and other symptoms of the weakened or senile state of the nervous system, induced before the usual period.

Among other effects of excess in snuffing, I have found all the symptoms of dyspepsia produced by it, and particularly pains of the stomach, occurring every day. The dependence of these upon the use of snuff became very evident from hence, that upon an accidental interruption of snuffing for some days, these pains did not occur ; but upon a return to snuffing, the pains also recurred ; and this alternation of pains of the stomach and of snuffing having occurred again, the snuff was entirely laid aside, and the pains did not occur for many months after, nor, so far as I know, for the rest of life.

A special effect of snuffing is its exciting a considerable discharge of mucus from the nose : and there have been several instances of headaches, toothachs, and ophthalmias, relieved by this means. And this is to be particularly remarked, that when this discharge of mucus is considerable, the ceasing or suppression of it by abstaining from snuff, is ready to occasion the very disorders of headach, toothach, and ophthalmia, which it had formerly relieved.

Another effect of snuffing to be taken notice of is, that as a part of the snuff is often carried back into the fauces, so a part of this is often carried down into the stomach, and then more certainly produces the dyspeptic symptoms mentioned. These are the considerations that relate to snuffing : and some of them will readily apply to the other modes of using this drug.

Smoaking, when first practised, shows very strongly the narcotic, vomiting, and even purging powers of tobacco : and it is very often useful as an anodyne. But by repetition these effects disappear, or only show themselves when the quantity smoaked is beyond what habit had before admitted of ; and even in persons much accustomed to it, it may be carried so far as to prove a mortal poison. From much smoaking all the same effects may arise which we said might arise from excess in snuffing.

With respect to the evacuation of mucus which is produced by snuffing, there are analogous effects produced by smoaking, which commonly stimulates the mucous follicles of the mouth and fauces, and particularly the excretories of the salivary glands. By the evacuation from both sources, with the concurrence of the narcotic power, the tooth-ach is often greatly relieved by it ; but we have not found the smoaking relieve head-achs and ophthalmias so much as snuffing often does. Sometimes smoaking dries the mouth and fauces, and occasions a demand for drink ; but, as commonly the stimulus it applies to the mucous follicles and salivary glands draws forth their liquids, it occasions on the other hand a frequent spitting.

So far as this is of the proper saliva, it occasions a waste of the

liquid so necessary in the business of digestion ; and both by this waste and by the narcotic power at the same time applied, the tone of the stomach is often weakened, and every kind of dyspeptic symptoms is produced. Though in smoaking, a great part of the smoak is again blown out of the mouth, still a part of it must necessarily pass into the lungs ; and its narcotic power applied there often relieves spasmodic asthma ; and by its stimulant power it there also sometimes promotes expectoration, and proves useful in the catarrhal or pituitous difficulty of breathing.

Smoaking has been frequently mentioned as a means of guarding men against contagion. In the case of the plague, the testimony of *Dimerbrock* is very strong ; but *Rivinus* and others give us many facts which contradict this : and *Chenot* gives a remarkable instance of its inutility. We cannot indeed suppose that tobacco contains an antidote of any contagion, or that in general it has any antiseptic power ; and therefore we cannot allow that it has any special use in this case. But it is very probable that this and other narcotics, by diminishing sensibility, may render men less liable to contagion ; and by rendering the mind less active and anxious, it may also render men less liable to fear, which has so often the power of exciting the activity of contagion. The antiloimic powers of tobacco are therefore on the same footing with those of wine, brandy, and opium.

The third mode of using tobacco is that of chewing it, when it shows its narcotic qualities as strongly as in any other way of applying it ; though the nauseous taste of it commonly prevents its being carried far in the first practice. When the practice, however, is continued, as it is very difficult to avoid some part of it dissolved in the saliva from going down into the stomach ; so this, with the nausea excited by the taste, makes vomiting more readily occasioned by this than the other modes of applying it. They are the strong, and even disagreeable impressions repeated, that give the most durable and tenacious habits ; and therefore the chewing of tobacco is apt to become one of these : and it is therefore in this way that it is ready to be carried to the greatest excess, and to show all the effects of the frequent and large use of narcotics. As it commonly produces a considerable evacuation from the mouth and fauces, so it is the most powerful in relieving the rheumatic affection of the tooth-ach. This practice is also the occasion of the greatest waste of saliva ; and the effects of this in weakening digestion, and perhaps from thence especially, its noted effect of producing emaciation may appear.

These are the effects of the different modes of employing tobacco, when it comes to be of habitual use and an article of living. These effects depend especially upon its narcotic power, and certain circumstances accidentally attending its application to the nose and mouth ; but as we have observed before, that besides its narcotic it possesses also a stimulant power, particularly with respect to the alimentary canal ; by this it is frequently em-

ployed as a medicine for exciting either vomiting or purging, which it does as it happens to be more immediately applied to the stomach or to the intestines.

An infusion of from half a drachm to a drachm of the dried leaves, or of these as they are commonly prepared for chewing, for an hour or two, in four ounces of boiling water, affords an emetic which has been employed by some practitioners, but more commonly by the vulgar only. As it has no peculiar quality as an emetic, and its operation is commonly attended with severe sickness, it has not been, nor is it likely ever to come in common practice with physicians.

It is more commonly employed as a purgative in glysters; and, as generally very effectual, it is employed in all cases of more obstinate costiveness: and its powers have been celebrated by many authors. I have known it to be in frequent use with some practitioners: and it is indeed a very effectual medicine, but attended with this inconvenience, that when the dose happens to be in any excess, it occasions severe sickness at stomach; and I have known it frequently occasion vomiting.

It is well known, that in cases of obstinate costiveness, in ileus and incarcerated hernia, the smoke of burning tobacco has been thrown into the anus with great advantage. The smoke operates here by the same qualities that are in the infusions of it above mentioned. But as the smoke reaches much further into the intestines than injections can commonly do, it is thereby applied to a larger surface, and may therefore be a more powerful medicine than the infusions. In several instances, however, I have been disappointed of its effects, and have been obliged to have recourse to other means.

The infusion of tobacco, when it is carried into the blood-vessels, has sometimes shown its stimulant powers exerted in the kidneys: and very lately we have had it recommended to us as a powerful diuretic of great service in dropsy. Upon the faith of these recommendations we have now employed this remedy in various cases of dropsy, but with very little success. From the small doses that are proper to begin with, we have hardly observed any diuretic effects; and though from larger doses they have in some measure appeared, we have seldom found them considerable: and when, to obtain these in a greater degree, we have gone on increasing the doses, we have been constantly restrained by the severe sickness at stomach, and even vomiting, which they occasioned; so that we have not yet learned the administration of this remedy so as to render it a certain or convenient remedy in cases of dropsy.

The same circumstances have occurred to several other practitioners of this city and neighbourhood: and of late the trials of it have been very generally omitted, owing perhaps to our practitioners being directed at the same time to the use of the digitalis, with which they have had some success.

From some experiments we are certain that tobacco contains a quantity of volatile parts that may be dissipated by long boiling in water: and that by such a practice its emetic, purgative, and narcotic qualities may be greatly diminished: and we are of opinion that the preparation in extract, as prescribed in the Wirtenbergh dispensatory, is upon a good foundation, and may be employed in pectoral cases with more advantage and safety than the simple infusion or decoction made by a short boiling only.

When we were restrained in employing the infusion of tobacco as a diuretic, as mentioned, we expected to succeed better with the decoction: and I have found that by long boiling, this might be given in much larger doses than the infusion: but we still found it retaining so much of the emetic quality, that we could not employ it as a diuretic without being interrupted in its use by the same emetic quality that had interrupted the use of the infusion.

Besides the internal uses of tobacco mentioned, I must now remark, that it has likewise been commended for its virtues as externally employed. I have known the infusion employed with advantage as a lotion for some obstinate ulcers. But the many instances of its being absorbed, and proving thereby a violent poison, dissuade from such a practice; especially as there are other medicines, of as much efficacy, that may be employed with much more safety. *Bergius* recommends it to be employed as a fomentation in the paraphymosis: but we have had no opportunity of employing it.

STRAMONIUM.

This is a powerful narcotic substance, and many instances are given of its proving a fatal poison. The seeds have been especially remarkable in this way: but the leaves are possessed of the same quality.

Neither of them had been employed as medicines till the Baron *Storck*, among the other poisonous plants, thought of trying this. He made the expressed juice of the plant into an extract, and employed this in some cases of mania, epilepsy, and some other convulsive affections, and, as he reports, with some advantage. But he has been more reserved in his trials with this, and more temperate in recommending it, than with respect to most of the others he has practised with. Some other writers, however, have employed it, and recommended it; but they are chiefly the experiments of *Greding* which properly ascertain its powers and virtues.

This industrious physician employed it in a great number of maniacal cases: and, beginning with small doses, he proceeded to very large ones, but could not, in any one of the cases he employed it in, obtain a cure. It is remarkable, that in his experiments he employed two different preparations of the extract of the stramonium; the one he got from Vienna by the favour of

Baron *Storck*; the other from Leipsic by the favour of Professor *Ludwig*. The latter he found to be much more powerful than the former: and with respect to this, he puts the question, Whether the difference was to be ascribed to the difference of the soil in which the plants grew, or to any other cause? I consider it as a mark of the fallacy of extracts, and mention it here as a proof of that.

Dr. Greding employed the same extracts in a great number of epileptic cases, and in cases of epilepsy joined with mania. But, except in one single instance, he made no cure: and the great number of cases in which it failed, lead me to judge it to be a medicine seldom suited to the cure of those diseases. There are indeed cases of both diseases reported by persons of good credit, in which the stramonium succeeded. But I do not admit this as a proof of any peculiar power in the stramonium; as there are many instances of other narcotics having the same effect. I have no doubt that narcotics may be a remedy in certain cases of mania and epilepsy; but I have not, and I doubt if any other person has, learned to distinguish the cases to which such remedies are properly adapted. It is therefore that we find the other narcotics, as well as the stramonium, to fail in the same hands in which they have in other cases seemed to succeed. It is this consideration that has occasioned my neglecting the use of the stramonium, and therefore prevented me from speaking more precisely from my own experience on this subject.

LAURO-CERASUS.

This is a sedative of the most powerful kind, but hitherto little employed as a medicine. But I enter upon the consideration of it here, as the matter it contains, which renders it so powerful, is also present in several substances which have been frequently employed as medicines, and whose properties therefore may be best illustrated by treating first of the *Lauro-cerasus*.

Since the year 1733, when the first account of the poisonous quality of the *lauro-cerasus* was published, many experiments have been made, which all concur in showing, that the distilled water from this plant is one of the most powerful poisons that we are acquainted with: and these experiments have now been published in so many books, that it seems quite unnecessary to repeat them here.

The operation of this poison has been very various, according to the dose in which it has been employed, and to the size, perhaps the constitution, of the animal to which it has been applied. But in a certain dose it has universally proved a fatal poison. In many cases it has very immediately induced death, without any previous disorder: and if, in other cases, it has excited convulsions, tetanus, palsy, and several evacuations, it does not seem owing to any peculiar property of this poison, but to the moderate dose of it, which, during its gradual operation, allows a various re-action of the system. We have a fine illustration

of this in *Langrish's* experiments, in which, p. 67, he tells us that one ounce of laurel-water will occasion more violent and stronger convulsions than five or six ounces will do. For this he gives a theory which I do not understand: and I think it needs no other than that the larger dose proves more immediately fatal.

The tendency of the lauro-cerasus is plainly to destroy the mobility of the nervous power, and thereby the vital principle: and, when employed in sufficient quantity, it does this very suddenly in every animal to which it has been applied, without exciting inflammation in the part to which it had been more immediately applied, and without producing any sensible change on the state of the fluids. If it seems to some persons to coagulate, and to others to render the fluids more thin, we have not taken any pains to ascertain either of these facts, because there is no proof of its acting directly upon the fluids: and therefore, any changes which happen to appear in these must be imputed to a change in the action of the vessels, which we know has a great power in changing the state of the fluids. We must own, however, that to explain the effects of the lauro-cerasus in this respect, we know yet too little of the changes which the fluids are capable of undergoing by the various action of the vessels.

With respect to the sedative power of the lauro-cerasus, it may be remarked, that its operation upon the nervous system is different from that of opium and other narcotic powers, which, in their first operation, commonly induce sleep, and which I do not find to have been ever observed as the effect of the lauro-cerasus. May it be supposed that the animal and vital functions depend so much upon a different condition of the nervous system, that one kind of poison may act upon one of these functions more readily than upon the other, while another kind of poison may act more directly upon that other set of functions and less upon the former. If there is any foundation for this supposition, we might say that the narcotic poisons act first upon the animal functions, though their power may at length be extended also to the vital; and that the lauro-cerasus, and other poisons analogous to this, act more immediately upon the vital functions, without shewing any intermediate affection of the animal. If such a speculation may be indulged, we would allege that the poison of the mad dog seems to operate more immediately upon the natural functions than upon either the vital or animal. But whether such speculations are to be indulged, or what application they are capable of, we must leave to future philosophers to judge.

The active matter of the lauro-cerasus lies in its most volatile parts, and is therefore readily carried over with water or spirit, in distillation; and may be still rendered more active by cohobation, and especially if, without any addition of water, it is distilled in *balneo marie*. In distillation with water, it gives out an essential oil, which, either taken by itself, or diffused, as it may

readily be in the distilled water, shows that it contains some of the most active parts of the plant.

By these operations for obtaining the more volatile parts of the lauro-cerasus, a singularly powerful poison is obtained ; but the same power is also to be found in the entire substance of the plant, with this difference only, that this, to shew the same degree of power, must be employed in much larger doses than the other. This explains very well why a portion of the plant, often employed as an article of diet, had not before discovered its poisonous quality : and this leads me to remark, that ever since its poisonous qualities have been discovered, it has been proposed to be employed as a medicine, either by employing the volatile part in small doses, or the substance of the whole plant in larger. That a matter of such power in changing the state of the animal æconomy should, in certain circumstances, prove a medicine, we can have no doubt : but we have not yet learned to what circumstances of disease it is peculiarly adapted. Its power of rendering the blood more fluid is not certainly or universally proved ; and though it were, as, by the reflection we made above, the change that appears is more probably depending upon the state of the vessels than any direct action upon the fluids ; so we hold this state of matters to be too mysterious to admit of any application in medicine. We must further remark, that all judgment, made from the state of the blood drawn out of the veins to that of its state in the blood-vessels, is extremely fallacious, unless a nice and strict attention is given to the circumstances of the extravasation, and which we have not found to be commonly bestowed.

There is a circumstance commonly taken notice of in favour of a fluidity being induced by the lauro-cerasus, which is, that the blood in several places is found to have passed from the red vessels into the serous. But as this seems to have happened only after frequent and strong convulsions, it is with more probability imputed to an increased action in the arteries, which has often this effect of pushing red blood into the serous vessels, than to the increased fluidity of the mass ; and it is in the same manner that we would account for the fullness of the veins and the emptiness of the arteries, which have been found to be the effects of the lauro-cerasus. To confirm these opinions with regard to the fluidity of the blood, and the application of it to medicine, it is only necessary to add, that when the lauro-cerasus is given in such a manner as instantly to kill, without occasioning almost any other disorder, there is not any mark of change in the state of the blood, to be perceived. And upon that occasion, that the death is owing to an operation upon the blood, I believe there is no other physiologist in Europe, except the Abbe Fontana, who can imagine.

I have made these observations to prevent any rash application of the lauro-cerasus, from the supposition of its producing a

fluidity of the blood: and I find no proof of its having been applied, upon that supposition, to any good purpose; and particularly that it has been of use in cases of phthisis pulmonalis, or that it has been of use in resolving obstructions of the liver, seems to be concluded upon too few experiments.

Although we do not find the benefit of its internal use in resolving obstructions well ascertained, we are somewhat disposed to believe, that its external use may be useful in resolving certain schirrosities. Even this power, however, is not sufficiently ascertained, though we shall hereafter mention some analogies that seem to support it. By another analogy also, I find a virtue ascribed to the lauro-cerasus rendered very probable. *Dr. Brown Langrish* tells us, that the lauro-cerasus in his neighbourhood was frequently employed in the cure of agues. He unhappily omits the dose, manner of administration, or peculiar circumstances of the disease. But the experiments of *Bergius* with bitter almonds sufficiently confirm the general power of such bitters in the cure of intermittents.

We do not find room to say any more on the medicinal virtues of the lauro-cerasus: but from its general power, they are certainly probable, and will hereafter, in the hands of a future *Storck*, be ascertained. To encourage such inquiry, we must remark, that the lauro-cerasus has hardly in any experiment shown any tendency to produce topical inflammation: and in many experiments on brutes, though the employment of the lauro-cerasus has been carried so far as to produce various and violent disorders of the system; yet upon withdrawing the exhibition of it, the animal has soon after recovered a seemingly entire state of health. These may give encouragement to some trials; but I hope it will never be forgotten, that a matter which has so strong a tendency to extinguish the vital principle, is to be employed with the utmost caution.

Here, immediately after the lauro-cerasus, it seems proper to mention some articles of the materia medica which contain the same kernel bitter, and which can be extracted from them in such a manner as to shew the same deleterious power: but as they contain it in a less concentrated and weaker state, they are therefore more readily to be admitted as articles of the materia medica.

The first we shall take notice of is the

CERASA NIGRA.

The kernels in the stones of these fruits do certainly contain a like matter with the lauro-cerasus; and by a certain management a very powerful poison can be obtained from them. But certainly they do not contain it in the same proportion: and it is a question with me if the distilled water, as formerly extracted from black cherries and their bruised kernels, contains it in such a quantity as to engage the colleges both of London and Edinburgh to reject an agreeable water from their dispensaries. If the kernels are bruised only so far as necessary to the

breaking of the stones, and at the same time that a good deal more water is added than the weight of the cherries, and that less than the whole of this is drawn off, I am persuaded that such a water will be very safe, and particularly in the quantities employed in our juleps. I shall not indeed advise the tampering with such a matter in the case of infants: but surely that a matter, under a certain preparation, and in a certain dose, is a poison, will not, in the present age, be an objection to its being employed in other circumstances as a medicine.

I might here take notice of the flowers and leaves of the peach tree, all of which contain the kernel bitter. But after what I have said of the black cherry, and am to say of the bitter almond, I do not think it necessary to speak of substances which I have not been acquainted with in practice.

AMYGDALÆ AMARÆ.

These have been long known to be a poison with respect to many brute animals; and there are some instances alleged of their being such to men. We at present understand this from observing that they contain the same peculiar bitter that is found in the lauro-cerasus, and in the other kernels mentioned above. It is alleged that they are not so powerful with respect to men as they are to other animals: and they have, in a certain quantity, been often admitted both in diet and medicine. Their medicinal qualities, however, are, as I have said before, not well ascertained. But there is one virtue, which is, their being a remedy in intermittent fevers, that is well established on the authority of the learned *Bergius*.

His manner of administration is the following: he takes two drachms of soluble tartar and an ounce and half of honey. These he diffuses in a pound of water; and with this water he makes an emulsion with one ounce of bitter almonds, to be strained in the ordinary manner. Of this emulsion he gives, during the intermission, a pound or two every day; and says that, by this remedy, the recurrence of fits is prevented. He acknowledges, indeed, that certain fevers have resisted this remedy, and obliged him to have recourse to the bark: but even then, with the decoction of the bark, he mixes the bitter emulsion. And he says also, that he has seen intermittent fevers frequently recurring, and which had entirely resisted the bark, at length entirely cured by the bitter emulsion alone. I have had so little opportunity in this country of practising upon intermitting fevers, or upon any but those which readily yield to the bark, that I have never had occasion to imitate the practice of *Bergius*. But if I were to have the opportunity, I should certainly proceed with some caution in exhibiting such quantities of the bitter almond.

The ancients had an opinion, that bitter almonds taken before drinking wine would prevent it from causing ebriety; but *John Bauhin*, from experiments made on purpose, denies them to have this power.

CAMPHIRE.

This is a substance, whether chemically or medicinally considered, of a very peculiar nature.

The chemists have subjected it to many experiments, and given us many particulars with respect to its chemical history. But I do not find that they have clearly ascertained its composition: and I cannot indeed perceive that their experiments have any influence in the consideration of it as a medicine. They have given us some instruction in the pharmaceutic treatment proper for its most convenient exhibition. But they have not given us any preparation of it that either increases or diminishes its power with respect to the human body. I hold it therefore unnecessary here to enter into its chemical history.

This substance, as we have it in our shops, and employ it in medicine, is obtained from a tree now sufficiently known to our botanists, and distinguished by the trivial name of *Laurus Camphora*. What we employ is chiefly the growth of Japan; though there are several other trees in the East-Indies which afford the same substance. But as I do not know that the camphire obtained from these other trees is ever brought into Europe for the purpose of medicine, or, if they are, that they differ in the least from that which we commonly employ, I do not think it necessary for me to prosecute the natural history of it further; nor is it anywise proper for me to speak of the manner in which this substance is obtained from the trees affording it; of the different states in which it is found and transmitted to Europe; or of the several operations by which it is brought into that form in which we have it in our shops.

These are particulars that may be of some curiosity with respect to chemistry and trade. But there is certainly no foreign drug so little liable to any variation or adulteration, or that comes into our hands so steadily and uniformly of the same appearance and qualities, and therefore requiring less of our acquaintance with its previous history.

With a view to its medicinal history, it may be proper to remark, that since we became acquainted with this peculiar substance from the East Indies, the chemists have supposed, that a substance precisely of the same kind was to be found in many European plants. In many instances they have supposed this without any clear proof. But they have certainly, in several instances, demonstrated its existence in the clearest manner. It does not, however, seem necessary to enter into any enumeration of those plants; because, even in the instances in which the presence of camphire is most clearly demonstrated, it is even in these in such small proportion, that it has not given any modification of their ordinary virtues, or that these substances have been employed, or can be employed, as a medicine, for the purposes which camphire, in its separate state, is or may be employed.

After setting aside so many particulars that might have entered

into a treatise of camphire, it is time for me now to come to my proper business, which is the consideration of camphire as a medicine. This I find to be a difficult task ; as I must encounter the various and contradictory opinions that have been maintained with respect to it.

The opposition of opinions appears strongly from hence, that the controversy has been commonly brought into the single question, Whether camphire be a heating or a cooling medicine with respect to the human body? Or, as I would put it in other words, Whether it is a stimulant or a sedative power? The question has been often attempted to be determined by frivolous and ill-founded theories, both on one side and the other ; but these shall be here entirely neglected ; as we judge the question must be absolutely determined by experiments made upon the human body, assisted however by some analogy, wherever it can be safely drawn, from experiments on brutes.

To this purpose we remark, in the first place, that camphire taken into the mouth is of an acrid taste ; and though, by its evaporation, it excites a sense of cold air, what remains is a sense of heat in the mouth and fauces : and when taken down into the stomach, it often gives some pain and uneasiness, which we impute to the operation of its acrimony upon the upper orifice of that organ. These may be considered as marks of its heating quality ; and the same are more strongly marked by its application to any ulcerated part, which it always evidently irritates and inflames.

These are indeed marks of a stimulant power ; but hardly any thing corresponding to these appears upon its being thrown into the stomach of man or brute animals. It appears that in the stomach of animals it operates there by a small portion of its effluvia ; for when a mass of any bulk has been thrown in, though it has produced considerable effects upon the body, neither the bulk nor the weight of what had been thrown in are found to be sensibly diminished : and in such cases it cannot be doubted that the operation has been entirely upon the nerves of the stomach, and by these on the rest of the system. This operation seems to me to be entirely that of a sedative power ; and we take its being of that kind on the stomach itself, which occasions the indigestion of food, which has been constantly observed to follow its exhibition in any large quantity.

The sedative effects, however, are still more evident and considerable in the sensorium. The death of so many animals, suddenly occasioned by it, in the experiments of *Menghin*, can be explained in no other way but by the power of this substance, like that of other poisons, in destroying the mobility of the nervous power, and thereby extinguishing the vital principle. It is in illustration of this that it so often operates by first inducing stupor and sleep : and the other symptoms of delirium, furor, and convulsions, can all be probably explained as we have done with

respect to other poisons, by the struggle that occurs between the force of the sedative power and the re-action of the system.

But before we go further, it is proper to inquire what are its effects on the sanguiferous system. And here at least we can assert that it shows in the first instance no stimulant power. I regret, that in the account of the experiments on brutes that we have met with, there is no mention of the state of their pulse: but I think we have enough of experiments on men to ascertain this matter. The experiments of *Hoffman* assure us, that the pulse was not rendered more frequent, or the skin warmer, by twenty grains and upward of camphire being taken into the stomach. The experiments of *Griffin* and *Alexander* rather show that the frequency of the pulse was diminished by large doses of camphire. To these we may add the experiments of *Berger*, *Werlhoff*, *Lusonne*, *Home*, and especially those of *Collin*.

The last, in giving some hundred instances of the exhibition of camphire in large doses, even to the quantity of half an ounce in the course of one day, has not in any one instance taken notice of the frequency of the pulse, or of the heat of the body being increased by it. In the case in which half an ounce of camphire had been exhibited, the patient was examined by the Baron *Van Swieten*, and some other physicians, who could not miss to have taken notice of its heating the body, if any such effect had appeared. I myself have frequently given twenty grains of camphire, without ever finding the frequency of the pulse increased by it, and sometimes manifestly diminished.

I once had a maniacal patient, a young woman between twenty-five and thirty years of age, whom I was resolved to try the cure of by camphire: and beginning by five grains for a dose, and increasing it by the same quantity every evening, I brought it at length to a dose of thirty grains: and that dose, in imitation of *Dr. Kinneer*, I repeated for four nights together. During all this I never found the frequency of the pulse increased; and when the larger doses were employed, the pulse was frequently brought to be ten strokes fewer in a minute than it had been before. At the same time, so little change was made in the state of the mania, that I was resolved to give up the trial; but the apothecary, by a gross error in *Baddam's* abridgement of the *Philosophical Transactions*, was led to think that I had mistaken *Dr. Kinneer's* practice, and had not carried the dose of camphire so far as he had done. Proceeding upon this supposition, he presumed to give forty grains of camphire for the next night's dose. In about half an hour after this had been exhibited, I was sent for to see my patient; who, after beating upon her breast, as if she had felt some uneasiness there, had fallen down seemingly in a faint. She appeared to me quite insensible, with her pulse very weak, and hardly to be felt, and her breathing hardly to be observed, with a paleness and coldness over her whole body. I

judged her to be dying. But by holding some spirits of hartshorn to her nose, and chafing her extremities with warm flannels, she was so far recovered as to swallow a little warm milk, and afterwards a little warm wine. And by these measures continued for two or three hours, her pulse and the heat of her body were a good deal recovered, and she had the appearance of being in a sleep, in which she was allowed to continue till morning, when she came out of it by degrees, with her pulse very much in its natural state. At the same time the mania was also in the same state as before, and continued to be so for some months afterwards, when I ceased to enquire after her.

Dr. Hoffman gives us the history of a person, who, by mistake, took at one draught two scruples of camphire, which occasioned violent disorder. But the operation was at first like that in the case above mentioned, a weakness and paleness of the whole body, which evidently showed a sedative operation.

From so many experiments directly in point, I shall be surprised if any body shall deny the sedative and assert the stimulant power of camphire: and when I find *Quarin* giving the following account: "*Vidi enim,*" he says "*in multis, quibus camphora majori dosi exhibita fuit, pulsum celerrimum, faciem ruberrimam, oculos torvos, inflammatos, convulsiones et phrenitidem lethalem secutam fuisse,*" I, who in a hundred instances of the exhibition of camphire, both in smaller and larger doses, never saw such effects produced, must think that either he or I had our senses strangely biassed by preconceived opinions of the stimulant or sedative power of camphire. I am, however, the more disposed to trust to my own senses, because I have frequently had my fellow-practitioners concurring with me in the same perceptions.

But it is time for me to remark, that all observers are liable to some uncertainty and ambiguity in these matters. I am well persuaded, that in the case of all poisons which do not immediately and entirely extinguish the powers of life, there is a re-action of the system which has a tendency to resist and overcome the power of the poison; and that this re-action operates in various ways, sometimes in exciting the action of the heart and arteries, and producing fever; sometimes in exciting the energy of the brain, and producing convulsions; and probably in other ways which we do not clearly perceive nor can explain. But it is enough that such a power exists: and that its effects are often so mixed with those of the poison, as to render it difficult, in most cases, to determine what are the effects of the one or the other, which has certainly occasioned many phenomena to be imputed to the direct action of the poison, which are, however, purely the effects of the re-action above mentioned.

We do not, however, venture upon assigning these effects more particularly; as I perceive that they are greatly diversified, according to a variety of circumstances; as, 1st, the power and activity of the poison: 2d, the quantity of it, and as it has been

more or less suddenly introduced ; 3d, the size of the animal to which it is applied ; 4th, the constitution of the animal, as more or less powerful in re-action ; and 5th, according to the time which has been allowed for the operation of these circumstances. This will perhaps remove some of those difficulties which might otherwise have occurred.

It particularly might be alleged in favour of the stimulant power of camphire, that in the animals which have been killed by large doses of it, many of the viscera have been found in a very inflamed state. But I cannot allow this to have been the direct effects of the camphire ; for there are no instances of this inflamed state appearing in the animals killed soon after the taking in of the poison.

The suddenness of the death, in many cases, occasioned by a direct action on the nervous system, allows of no supposition of previous inflammation. And the sudden recoveries which have sometimes happened after very large doses, assure us that in such cases no inflammation had been formed in any part of the body. It seems therefore certain, that inflammation is not the direct operation of this substance ; and that the inflammation sometimes found, as above mentioned, must be imputed to that agitation of the system produced by the conflict that had subsisted for some time between the powers of the poison and of the re-action.

It is true that camphire shows a stimulant power in parts of great sensibility, as in the mouth, in the upper orifice of the stomach, and in ulcers where the nerves are laid bare : but there is no proof of its taking place in any other part of the system : and how little it is disposed to operate in this manner, we may judge from hence, that, rubbed upon the skin in the most concentrated state, it produces no redness or other mark of inflammatory action there : and we shall have occasion to observe below, that it has a special power in taking off the inflammatory state of the subjacent parts.

I have thus endeavoured to ascertain the operation of camphire in general upon the human body ; and have especially endeavoured to correct the most common opinion, that of its calefacient power ; which I think has on many occasions perverted the practice.

Having thus ascertained the general operation, we are next to enquire what are the diseases to which it is more especially adapted. And in doing this, we find it difficult to repeat after practical writers, both on account of their different opinions with respect to the general operation, and with respect to the pathology of the diseases in which they employ this medicine, as these different opinions very much affect their reports on this subject.

It has been much employed in fevers of all kinds, particularly in nervous fevers attended with delirium and much watchfulness : and in such I have frequently employed it with advantage.

Some time ago, I often saw it employed by my fellow-practitioners in such cases : and that the good effects of it did not always appear, I imputed to its being used only in small quantities. Since we came into the free use of wine and opium, camphire has been little employed in the practice of this country. The use of it, however, has been very fully established by some of the most eminent physicians on the continent : among these I reckon the late learned and experienced *Werlhoff*, who often employed it in many inflammatory diseases with great benefit, and plainly gives us his opinion in favour of its refrigerant power.

The use of this medicine has been especially remarked in putrid fevers, of which indeed we have not many instances in this country : but from the very remarkable antiseptic powers which it discovers in experiments out of the body, it is very probable that when thrown into the body in large quantities, so that at least its more subtile parts may be diffused over the whole system, it may be expected to produce considerable antiseptic effects. Its power in resisting and curing gangrene in the experiments of *Collin*, are very remarkable : but whether that power be owing to its antiseptic virtue alone, or to its operation at the same time on the nervous system, I would not rashly determine.

Both from its use in low, or what are called Malignant Fevers, and from its antiseptic powers, it is highly probable that it has been of great service in the confluent small-pox. It is also likely that it may be of service in favouring the eruption of exanthemata, and of bringing them back to the skin, when from any cause they had suddenly receded ; though I have no particular experience of this.

These are the cases of acute diseases in which camphire has been useful : and its use in many chronic cases is equally well authenticated. Whenever diseases depend upon a mobility of the nervous power, and an irregularity of its motions, it may be expected that such a powerful sedative should be of service. Accordingly, many practitioners have reported its virtues in hysteric and hypochondriac cases : and I myself have had frequent experience of it.

In spasmodic and convulsive affections it has also been of service : and even in epilepsy it has been useful. I have not indeed known an epilepsy entirely cured by camphire alone : but I have had several instances of a paroxysm which was expected in the course of a night, prevented by a dose of camphire exhibited at bed-time ; and even this when the camphire was given alone : but it has been especially useful when given with a dose of cuprum ammoniacum, of white vitriol, or of the flowers of zinc.

Since the report of *Dr. Kinnear*, in the Philosophical Transactions, Vol. XXXV, camphire has been often employed in cases of mania : and I have given above an account of a trial which I had made of it. In that case, however, it was not successful ; nor

in several other trials has it been more so with me or other practitioners in this country.

We have had here lately, in a patient under the care of Mr. Lata, surgeon, a notable example of the use of camphire in a maniacal case, which I think it proper to take notice of here.

A young man of sixteen, seemingly of a sound constitution, without any previous cause that could be assigned or suspected, was affected with a loquacity very unusual with him. It continued for some weeks, but at the same time with some confusion of head gradually increasing to somewhat of delirium. And these symptoms for some weeks went on gradually increasing till the patient became quite maniacal, and so unmanageable, as required his being tied down to the bed. In this state, bleeding, blistering, vomiting, and purging, and every other remedy that could be thought proper, were employed with great assiduity, without any effect however in moderating the disease. It was then thought proper to try camphire. He got it at first in doses of five grains three times a day: and this dose was repeated every day, and increased by two grains till it came to be above sixty grains, given three times every day. Whilst the doses were not more than two scruples, they seemed to have no effects either good or bad: but as the doses were farther increased, they came by degrees to give more sleep, and in the intervals of that to render the symptoms of the mania more moderate. And before the doses came to be so large as I have mentioned, his sleep came to be more and more, and his senses came to be in the ordinary state of health; and with very little interruption, from an accident which we could not account for, a very perfect state of health has continued ever since, which is now for seven months.

This shows clearly enough the power of camphire in mania: and I have only to add, that though in several other instances it has not made a cure, it has not, in any instance of a moderate dose, that is, not exceeding half a drachm, occasioned any disorder in the system: and in several cases it has induced sleep, and rendered the mind for some time more quiet.

I observe that *De Berger* has been more successful: and perhaps the reason of our failure has been our not attending to his admonition. In his letter to *Werlhoff* on the subject of camphire, he has the following passage: "*Multoties hoc remedio in mea praxi utor, præcipue in inflammationibus internis, magno cum successu: et demiror tam multos medicos ab usu ejus interno abhorrere. Non diu est, quod præmissis præmittendis maniacum eo sanitati penitus restitui. In eo verò momentum præcipuum situm est, ut sufficient edosi et diu satis exhibeatur.*"

This is particularly confirmed by a case given by *Foerdens* in the *Commercium Norimbergense*. In several other writers there are accounts of maniacal and melancholic cases cured by the use of camphire. But many of the practitioners who report such cures acknowledge, that in many cases it had disappointed their

expectations. Whether these failures have been owing to the not employing at the same time nitre, vinegar, and some other remedies which are supposed to contribute much to the virtues of camphire, we would not determine. But we are clear that mania is a disease of considerable diversity with respect to its causes, and that there are certain cases of it only to which camphire is properly adapted. In cases of an organic affection of the brain, it is hardly to be supposed that camphire or any other remedy can be of use.

I have mentioned above, that several practitioners have employed camphire in the most acute inflammatory diseases: and therefore we are not surprised to find that it has been given also internally in cases of acute rheumatism; and it is said to have been with advantage. We have no experience of it; because we have found another method of cure generally successful. But I take this occasion to mention its external use, as often of great service in removing the rheumatic pains of the joints or muscles. This we have often experienced, and have no doubt of camphire having a peculiar power in taking off the inflammatory state in cases both of rheumatism and gout. In the case of rheumatism it is a matter of common experience. In the case of gout it is more rare: but I have had the following particular example of it. A gentleman had brought from the East-Indies an oil of camphire, a native substance, which seemed, by its smell and taste, to be no other than camphire in that form, and which I perceive to be mentioned by naturalists as a native substance, produced by several trees in the East-Indies. This the person possessed of recommended to all his acquaintances as an infallible remedy for gout and rheumatism: and a gentleman who had often laboured under the gout, and then felt the pains of it unusually severe, was persuaded to apply it. He had then the gout exceedingly painful in the ball of the great toe and instep of one foot. On this part he rubbed a quantity of the oil of camphire; and in about half an hour or a little more he was entirely freed from the pain he had before. In less, however, than an hour after, he had a pain and inflammation come upon the same part of the other foot. As the pain here became pretty severe, he again employed the oil of camphire, and with the same effect of soon relieving the pain very entirely. The consequence of this was also the same; for in less than an hour the pain and inflammation returned to the foot that had been first affected: and here again our patient, obstinate in persisting in the trial of his remedy, again applied to the oil, and he had the same success as before in relieving the part affected, and with the same effect also of occasioning a translation. But here the translation being made to the knee, the patient abstained from any farther application of the oil, and suffered the pain of the knee to remain for a day or two, and till it went off by some swelling and desquamation in the usual manner.

This history shows sufficiently the power of camphire in relieving the inflammatory spasm and pain of the part chiefly affected; but, at the same time, that it has no effect on the diathesis of the system; and that, when that subsists, as camphire is ready to occasion a translation, it will always be employed in gouty cases with great danger. In cases of acute rheumatism, we have had occasion to remark, that a strong solution of camphire in oil would relieve the pain of the joint for the time chiefly affected: but it was very often with the translation of it to another joint soon after: and we have therefore long ago ceased from employing such an application in all cases when an acute rheumatism was very general and strong in the system.

It may be supposed that it is analogous to this power of camphire in taking off the inflammatory state, that this medicine has been often found so useful in relieving toothach: and I have no doubt that camphire operates by the power mentioned in relieving toothach: but it is also by exciting a copious flow of saliva and mucus from the internal surface of the mouth, that water somewhat impregnated with camphire, employed to wash the mouth, has been frequently of service in relieving the disease.

However it may be with respect to toothach, we have no doubt that the antiphlogistic nature of camphire may be of use in curing ophthalmia: and this gives a good ground for the many attempts that have been made to introduce camphire into the medicines intended to be employed externally in the cure of ophthalmia.

We have now mentioned many of the virtues of camphire as employed by itself; and must now mention some instances of its peculiar utility when combined with other medicines.

When combined with drastic purgatives, it is said to moderate their acrimony, and thereby their violent operation. We have not indeed perceived this, and perhaps never tried it in a proper manner: but in the mean time, the respectable authority of *Mr. Lasonne*, sen. satisfies me that it is well founded.

Another opinion that has been very general is, that camphire has the power of correcting the acrimony of cantharides. In opposition to this, we would not quote the facts given by *Dr. Heberden* of two several instances in which camphire seemed to occasion strangury; for I must conclude these facts to have been very accidental occurrences; as I have employed camphire fifty times, even in large doses, without my ever observing its having any effect upon the urinary passages. *Mr. Lasonne*, sen. has observed, as I have done frequently, that camphire, though given very largely, never discovers its smell in the urine, whilst it frequently does it in the perspiration and sweat.

It was formerly a frequent practice in this country to anoint a blistering plaster that was to be applied to the back, or other part, with camphorated oil, and this with a view of preventing strangury from the cantharides. The practice, however, has been long ago laid aside: because it was perceived that, in most per-

sons, if the plaster was allowed to continue applied for above twelve hours, and while at the same time it was omitted to give the patient a large portion of drink, a strangury would come on notwithstanding the unction of camphorated oil, and even the exhibition of a quantity of camphire internally. The practitioners of this country have lost their faith in the power of camphire in correcting the acrimony of cantharides: and for preventing the strangury that might otherwise arise, they trust entirely to a large exhibition of Arabic emulsion, and to the plaster's not being allowed to lie on too long.

Another virtue ascribed to camphire in combination, is its moderating the action of mercury: and if the saline preparations of mercury are triturated with a portion of camphire, this abstracts a part of the acid that had been united with the mercury; and therefore renders the preparation more mild than before, and at the same time does not deprive entirely the preparation of much of its deobstruent virtue. This we have had experience of in that very acrid preparation of mercury, the turbeth mineral, and also in the mercurius dulcis or calomel, which, by being triturated with camphire, becomes less purgative, and less ready to excite salivation. How far this mitigation of the preparations of mercury leaves them equally powerful as before in the cure of syphilis, I cannot certainly determine; but am of opinion that it does not, if they be employed in the same quantities as they would have been before.

This mitigation of the saline preparations of mercury, by a combination with camphire, will be readily admitted. But many practitioners go farther, and allege that mercury, in every condition, united with camphire, becomes a more mild substance, less irritating to the system, while it is equally powerful in curing the diseases to which it is otherwise adapted. I must admit the experience of the practitioners of France in this matter: but those of this country know nothing of it. And I can assert, that in many trials, a quantity of camphire added to our common mercurial ointment neither prevented the unction, in the usual quantity, from exciting salivation, nor rendered the symptoms of it more mild than usual.

A peculiar combination of camphire said to have considerable effects, is that with opium. The employment of opium is in many persons attended with some inconvenience and disorder, as I have observed above; and every practitioner knows it to be alleged by some respectable persons, that camphire joined with it prevents these disorders. It may be so; but I have not found it in my experiments. I have found large doses of camphire dispose to sleep, but commonly with the same confusion of head and turbulent dreams which sometimes arise from the use of opium; and I have not found that a small quantity of camphire has any effects in increasing the power of opium, or of rendering the operation of it different from what it would have been if em-

ployed alone. But against the respectable authorities of *Lasonne* and *Halle*, I must suspect that my experiments have not been made properly or often enough.

There is still another instance of the improvement of a medicine by a combination with camphire. *Mr. Lasonne* assures us, that camphire joined with the Peruvian bark gives it more energy and force, whether it be to be employed for the purpose of curing fever or gangrene: and I believe this to be well founded.

After thus treating of the virtues of camphire, we must speak of its dose and exhibition. It will appear clearly from what is said above, that it may be given in doses of very different quantities: and it appears to me, from many trials, that doses of a few grains, repeated only after long intervals, have hardly any effect at all; and that, to obtain sensible effects from it, it must either be given in large doses, not under that of twenty grains, or, if given in smaller doses, they must be repeated frequently after short intervals. The latter practice is preferred by some eminent practitioners. To what length in either way we may proceed, I have not experience enough to determine with any precision. From the effects of two scruples given in one dose in the case narrated above, and in another quoted from *Dr. Hoffman*, it would appear that such doses are violent and dangerous. But from some other experiments, it appears that larger doses have been sometimes given with impunity: and when it is given in divided doses, it appears from *Collin's* experiments, that it may be given to the quantity of a drachm, or two drachms in the course of a day; and in one of his experiments it was given to the quantity of half an ounce: and the same will appear from the history which I have given above. It is probable that from large doses only, considerable effects are to be expected: and as, from many experiments, it appears that the effects of camphire are not very durable in the body, it will be obvious that the repeated and long continued use of it may be necessary to the cure of several diseases.

With respect to the exhibition of this medicine, it is, in the first place, necessary that it should be always very minutely divided; as we know it is not readily dissolved in the stomach; and while it remains there it will float on the surface of the other contents, and in that way be applied to the upper orifice of the stomach, and give occasion to some pain there. It ought therefore to be minutely divided before it be given: and this may be done by rubbing it first in a mortar with any dry powder, such as nitre or hard sugar. But to make certain of a minute division, it is proper at the same time to add a few drops of rectified spirit of wine, or other such spirituous menstruum as the spiritus vitrioli dulcis, or liquor anodynus mineralis of *Hoffman*.

It may also be divided by rubbing it with the mucilage of gum arabic: but this will also be more perfectly executed if the cam-

phire is previously dissolved by a little spirit of wine or expressed oil. By its being diffused in the mucilage of gum arabic, it may be again diffused in any watery fluid for more convenient exhibition: but it is to be observed, that camphire diffused in a watery fluid is ready to exhale from it, or arise to its surface, and to render the exhibition more disagreeable. When, therefore, any large quantity of water, in which camphire is diffused, is to be prepared at once, it is proper to employ some means for entangling the camphire. Sugar alone does not seem to be sufficient for the purpose: and it is more effectually done by triturating the camphire with mucilage alone, or with a portion of sweet almond, and diffusing it again by means of mucilage into an emulsion.

It has been thought that the virtues may be increased by exhibiting along with it a portion of nitre. But in many trials I have not been sensible of the benefit derived from nitre, which, in any quantity that can be conveniently employed, has little effect on the system. It is with more probability alleged, that vinegar exhibited with camphire is of service. Vinegar certainly gives the best means of correcting the taste of camphire, and seems even to render it less disagreeable to the stomach: and we may allow that both by its refrigerant and antiseptic powers, it may contribute somewhat to the virtues of the camphire.

THEA.

This is so universally an article of diet, that it deserves to be considered very fully. Being so much, however, an article of diet, it may be supposed that we should have treated of it in our first part. But as we cannot find it to afford any alimentary matter, and as its qualities give it the character of a medicine, we have reserved it for this place.

With respect to it as a subject of natural history, or as an object for commerce, having had no good opportunity of being properly informed, I must abstain from these discussions here; and must refer my readers to the information of the industrious *Dr. Lettsome*, who, I believe, has given it more fully and accurately than any other.

With respect to its qualities as a medicine, that is, its power of changing the state of the human body, we might suppose it ascertained by the experience of its daily use. But from the universality of this use in very different conditions of the plant, and every possible condition of the persons employing it, the conclusions drawn from its effect must be very precarious and ambiguous: and we must attempt by other means to ascertain its qualities with more certainty.

To this purpose it appears, from the accurate *Dr. Smith's* experiments, *De actione musculari*, No. 36, that an infusion of green tea has the effect of destroying the sensibility of the nerves and the irritability of the muscles: and from the experiments of *Dr. Lettsome*, it appears that green tea gives out in distillation,

an odorous water, which is powerfully narcotic.—That the recent plant contains such an odorous narcotic power, we might presume from the necessity which the Chinese find of drying it with much heat before it can be brought into use; and that even after such preparation, they must abstain from the use of it for a year or more, that is, till its volatile parts are still farther dissipated: and it is said, that unless they use this precaution, the tea in a more recent state manifestly shows strong narcotic powers. Even in this country, the more odorous teas often show their sedative powers in weakening the nerves of the stomach, and indeed of the whole system.

From these considerations we conclude very firmly, that tea is to be considered as a narcotic and sedative substance; and that it is especially such in its most odorous state; and therefore less in the bohea than in the green tea; and the most so in the more odorous, or what are called the finer kinds of the latter.

Its effects however, seem to be very different in different persons: and hence the different, and even contradictory accounts that are reported of these effects. But if we consider the difference of constitution, which occasions some difference of the operation of the same medicine in different persons, and of which we have a remarkable proof in the operation of opium, we shall not be surprised at the different operations of tea.

If to this we add the fallacy arising from the condition of tea employed, which is often so inert as to have no effects at all; and if we still add to this the power of habit, which can destroy the powers of the most powerful substances, we shall not allow the various and even contradictory reports of its effects to alter our judgement, with respect to its ordinary and more general qualities in affecting the human body.

From the experiments above mentioned, and from the observations which I have made in the course of fifty years, in all sorts of persons, I am convinced the qualities of tea are narcotic and sedative.

It has been often alleged, that some of the bad effects imputed to tea are truly owing to the large quantity of warm water which commonly accompanies it: and it is possible that some bad effects may arise from this cause. But from attentive observation I can assert, that wherever any considerable effects appear, they are in nine of every ten persons entirely from the qualities of the tea: and that any like effects of warm water do not appear in one of a hundred who take in this very largely.

But while we thus endeavour to establish the poisonous nature of tea, we do not at the same time deny that it may sometimes show useful qualities. It is very possible, that in certain persons taken in moderate quantity, it may, like other narcotics in a moderate dose, prove exhilarating, or, like these have some effect in taking off irritability, or in quieting some irregularities of the nervous system.

As its bad effects have been often imputed to the warm water that accompanies it, so we have no doubt that some of its good effects may be also ascribed to the same cause, and particularly its being so often grateful after a full meal.

CROCUS.

The natural history and preparation of this medicine is so commonly known, and delivered in so many books, that it is no ways necessary to repeat any part of it here.

Chemically considered, it appears to be a very peculiar substance. It may be extracted by either spiritous or watery menstruums, by wine or by vinegar: and each of these menstruums take out the whole of its odorous, sapid, or colouring parts. The tincture in spirit of wine does not become milky by the addition of water, and the tincture in water is not rendered turbid by the addition of spirit of wine. Its odorous part arises in distillation, both with water and spirit: and it is alleged, that in the former case a portion of essential oil appears; but neither the quantity nor quality of this is well ascertained.

Although the odorous part of saffron arises in distillation with either menstruum, yet a great portion of fixed matter is obtained in the extract: but the extract from water is very much changed from the nature of the entire saffron. That made with spirit of wine retains the sensible qualities of the saffron more entirely: but as there has been some dissipation of the odorous and volatile parts, we can hardly suppose that the concentrated tincture, or extract of *Dr. Boerhaave*, can obtain the whole of the medicinal substance of the entire saffron.

It seemed proper to give thus, as well as I could, the chemical history of this famous drug: but I must remark, that from this chemical history we learn nothing towards pointing out or explaining medicinal powers, nor indeed more from these than may be learned from its sensible qualities.

By these, being of some acrimony both in smell and in taste, it would seem that saffron might be very active with respect to the human body. But I have not been more puzzled upon any occasion than in ascertaining the medicinal qualities of this substance. The writers on the *materia medica* have constantly spoken of it as a very active medicine. But their reports of its effects are in some instances manifestly extravagant, though repeated by *Dr. Boerhaave* himself. And very frequent experiments in practice do not at all support the opinions that have been commonly entertained of it. I have given it in large doses, without its shewing any sensible effects; hardly in any degree increasing the frequency of the pulse: and as anodyne or antispasmodic, I have hardly observed its operation.

It has been especially famous for its supposed emmenagogue powers: and in one or two instances I have had some reason to believe in its power of this kind: but in many other instances, though repeatedly employed in large doses, it has entirely disappointed my expectations.

The common accounts of its producing hilarity are strongly contradicted by the account of Bergius, whose words are, "*Nobilis matrona semper in tristitiam illapsa est ingentem, postquam pulveres crocatos ei propinaveram.*" And his words before, "*Vidi hystericas quasdam a propinato croco valde emotas,*" are more pointed in favour of its power than any thing I have otherwise learned. I have employed it in every shape, in substance, in tincture, and in *Boerhaave's* extract, and in larger doses than authors have ever proposed: but still I have not discovered in it any considerable power or virtue.

It does not appear that the London College had much faith in it, as they have omitted to give us any tincture of it. They have indeed retained it in the *tinctura aloes composita*, and in the *pilulæ ex aloe cum myrrha*, and in larger proportion than the Edinburgh College do. But I must observe that I have frequently prepared these compositions without any saffron at all, and at the same time could not discern any diminution of their virtues. But in thus disparaging the virtues of saffron, I must acknowledge, that by a little attention, I have found the saffron of our shops to be often in a very imperfect condition, and therefore, that my experiments may have been sometimes affected by this.

NYPHÆA

I regret this standing in my catalogue, as it is now omitted in both the British dispensatories, and justly, as it has no virtue in its flowers. And though the roots have some astringency and bitterness, they have not so much as to deserve any place in our practice, when we have so many substances more powerful for the purposes for which these might be employed.

WINE AND ALCOHOL.

In the catalogues of narcotic sedative medicines I have set down *wine* and *alcohol*; because it seems necessary to give them a particular consideration here.

Wine I have formerly considered as a drink, and have there said all that seemed necessary with respect to its preparation: and from the various causes of this we have endeavoured to explain its various conditions, particularly the different matters of which it may consist; and, as depending upon these, the various sensible qualities that may appear in the different wines that are employed in our diet.

In all this, which it seems unnecessary to repeat here, I have supposed, that what constitutes a wine is its containing a portion of alcohol. But the effects of this in diet I took little notice of, and mentioned only the effects that might arise from the other matters which might accompany it in the different wines appearing upon our tables.

It is, however, as containing alcohol, that wines are to be considered as medicines; and the considering them as such we have reserved for this place, in which I have put them as narcotic sedatives.

That alcohol is such, can hardly be doubted; as, when only diluted with water so much that it can be swallowed, it shows the inebriating, intoxicating, and narcotic effects of other sedatives. When taken in small quantity, and much diluted, it does not indeed immediately show its sedative power: but, on the contrary, it may appear as a stimulant, cordial, and exhilarating liquor. As these operations, however, are in common to it with opium and other narcotics, they do not contradict our opinion of its proper sedative nature.

As in wine the alcohol is never in large proportion to the water at the same time present; and as in wine the alcohol is also blended with matters which diminish the force of it; wine can be, and commonly is employed as a stimulant, cordial, and exhilarating liquor, more conveniently than alcohol could be in any other way.

This explains why wine has been most commonly considered as a stimulant. But it is equally well known, that when taken to a certain quantity, it exerts all the sedative powers of alcohol or opium: and its medicinal qualities, according to the quantities in which it is employed, may be either stimulant or sedative.

Whenever, without fever, there is any languor or debility in the system, wine can be employed in moderate quantity with great advantage; as in most persons it is not only grateful to the palate, but also to the stomach: in which, if its acescent effects can be at the same time avoided, its cordial powers are immediately perceived; as from the stomach they are readily communicated to the whole of the system.

These are the virtues of wine employed in moderate quantities: and it is to be remarked by the way, that by its particular operation on the stomach it excites the action of this, and thereby promotes appetite and digestion; and passing further into the intestines, it does not so readily as other narcotics, suspend the action of these, and induce costiveness; but, on the contrary, by the mixture of its acescent parts with the bile, promotes the action of the intestines, and the evacuation by stool.

It may be further observed, that, carried into the blood-vessels, by the alcohol it contains it promotes perspiration; and by the water and saline matters at the same time introduced, it certainly passes to the kidneys, and promotes the secretion of urine.

Wine may produce all these effects, though taken in no large quantities; and they may be referred entirely to its stimulant powers or acescent qualities, which are in so far very commonly salutary.

It is difficult, however, to set the limits between its stimulant and sedative powers: and if the quantity of it be gradually increased, the latter gradually come on, and concurring with the former, produce at first a degree of delirium or ebriety, which is generally of the cheerful kind, and which occupying the mind, excludes all thoughts of care or anxiety: but the same sedative power carried on still further, renders the delirium more consi-

derable, and gives that irregularity and confusion of thought which is the state of intoxication. And at length the sedative power entirely prevailing, the animal functions, both of sense and motion, are gradually weakened, and the person falls asleep.

After thus detailing the several operations of both the stimulant and sedative power of wine upon men in health, I proceed to mention their effects in the various circumstances of disease.

In the first place, it will be obvious, that when the system is under any irritation increasing the action of the heart and arteries, the stimulant power of wine, even in the most moderate degree, must be hurtful: and as there is hardly any irritation more considerable or more permanent than inflammation subsisting in any part of the body; so in all pyrexia produced by inflammation wine must be particularly pernicious.

We are also persuaded that all active hæmorrhagies are attended with an inflammatory diathesis: and therefore it will equally appear that wine is improper in such cases.

But we proceed no further on this subject of the use of wine in diseases, as it may be governed upon the same principles we have laid down above with respect to opium; with this difference, however, that if the sedative powers of either are to be sought for, they are to be obtained more easily and certainly by opium than by wine. But where the stimulant powers of either are separately, or as combined with the sedative to be employed, the management may be more easy and accurate with wine than with opium.

One question only on this subject remains to be considered, and that is, whether alcohol, under any state of dilution, can be properly employed in place of wine and opium? We are of opinion, that in many cases it may; but that it will be always more difficult to separate the stimulant powers of alcohol from its sedative quality. In those cases, however, in which the stimulant powers are especially required, as in the case of resisting gangrene, the diluted alcohol may be employed as properly as wine: and therefore in the case of poor persons the former may be more convenient than wine.

CHAPTER VII.

REFRIGERANTS.

THESE are medicines supposed, as their title implies, to diminish the heat of the living body.

In many trials made on purpose, it has not appeared to me that the supposed refrigerants diminish that temperature of the body, which is the ordinary temperature of it in health: and therefore I am disposed to define the refrigerants to be such medicines as diminish the temperature of the body when preternaturally increased. It is especially upon such occasions that their power is

supposed and employed by physicians: and as the heat of the body, whether from internal or external causes, is never increased beyond its ordinary degree, but with an increased action of the sanguiferous system: so the refrigerants, as they diminish this increased action, are justly put under the general title of Sedantia; but being substances of quality and operation very different from those sedantia we have already considered, they are here to be treated of separately.

In what manner they produce their effects, is not well ascertained: and whether they act by diminishing the temperature of the body, as cold bodies, or those of a temperature lower than that of the body itself do, or if they operate only by removing the cause of heat, has been a question.

The former opinion has been frequently supposed, and that from a particular consideration. As the neutral salts, which are the refrigerants chiefly employed, do, upon being dissolved in water, generate a considerable degree of cold; so it has been supposed that they may in like manner generate cold in our bodies, and therefore produce their effects as by an actual cold applied. See *Brocklesby's* Observations, p. 122.

This conclusion, however, will readily appear to be mistaken, when it is considered that the cooling power of these neutral salts in water appears only during the time of their solution. When taken indeed undissolved, they may, as in *Brocklesby's* and *Alexander's* experiments, generate cold in the stomach, and from thence have particular effects: but as after solution they produce no permanent cold; so, when taken in a dissolved state, as they commonly are, their refrigerant powers cannot be ascribed to any actual cold applied.

The conclusion drawn from their solution in water further appears to be very erroneous, from this, that acids, which are as powerfully refrigerant in the human body as the neutrals, do however, upon being mixed with water, always generate heat: and even the neutral salts, when any how deprived of the water necessary to their crystalline state, do, upon that water's being restored to them, always generate heat. It is not therefore any thing in the nature of the saline matter that has a power of generating heat or cold in water or other bodies: but the appearance of such a power depends entirely upon the circumstances of solution or mixture, and appears no longer than these circumstances subsist.

It is not therefore by an actual cold applied that our refrigerants diminish the heat of the living body; although in what other manner they do it, may be difficult to explain.

We are, however, here, to venture upon a conjecture, which it is hoped may be founded; but whether it shall be or not, we throw it out as a conjecture only.

For this purpose I am disposed to admit of a doctrine delivered by the late ingenious *Turberville Needham*, which seems to

me to have been too little attended to in the physiology and pathology of the human body. We do not charge ourselves with supporting the whole of *Mr. Needham's* theories, or the applications of them which are opposed by *Spallanzani*; we only assume from him what we think he has demonstrated in fact, that there is every where in nature an expansive force and a resisting power; and that particularly under a certain degree of heat, the expansive power appears in all the parts of organized bodies, in consequence of which they show a singular vegetating power; while at the same time, in other bodies, there is a power, resisting and preventing the action of this vegetating power, and at least of diminishing its force. See *Nouvelles Observations Microscopiques*, 1750, p. 229, 230.

This resisting power he actually found in those saline bodies which we commonly suppose to be refrigerant powers with respect to the living body; and we hope that this doctrine may be applied to our purpose in the following manner. As heat is the great support of expansive force, so we suppose that every increase of heat is no other than an increase of the expansive force in the heated parts; and from this we conceive it may be understood how resisting powers may diminish any preternatural expansive force and heat in our bodies.

We thus endeavour to account for the refrigerant power of saline bodies; and the doctrine seems to be illustrated and further confirmed by this, that besides organized bodies, there seems to be an expansive force in all bodies disposed to any fermentation. This seems always to begin by an expansion of air from a fixed to an elastic state; and it is very certain, in fact, that by a contiguity of a sufficient quantity of saline substances, that is, of resisting power, the beginning of every fermentation is prevented. Such resisting powers have been often taken notice of as antiseptic; but there is hardly any doubt that the more general terms of Antyzimic may be fairly applied to them.

It may be proper to remark here, as not unheeded by us, that many other substances besides the saline may perhaps come under the list of Antizymics; but whether they are ever also refrigerant with respect to the human body, or why they are not, we cannot here presume to determine.

When we have gone thus far in the theory of refrigerants, we judge it to be incumbent upon us to acknowledge that there are some difficulties which occur upon this subject, and which it is proper to lay before our readers.

The operation of refrigerant powers, though we have supposed it different, seems in some respects to be analogous to the operation of actual cold applied. This not only changes the temperature of bodies, but in a certain degree proves a resisting and antizymic power. Its operation upon the body is attended with this peculiar circumstance, that when applied in a moderate

degree, and with no long continuance, it always increases the heat of the part to which it is applied; and from the redness which it at the same time produces, it is pretty certain that both effects are produced by its increasing the action of the blood-vessels in the parts. Its effects as a stimulant, are upon no occasion more remarkable than when any substance is taken into the stomach, of such a temperature as to feel cold there; it commonly produces a sense of heat on the surface of the body, and a disposition to sweat to be easily promoted, if at the same time the cold of the external air is by coverings avoided.

Quite analogous to this is the action of our refrigerants when taken into the stomach; for though we have denied their producing any actual cold there, they always produce a determination to the surface of the body, and a disposition to sweat; which from the analogy mentioned, we are ready to ascribe to a refrigerant power; or, if the expression may be allowed, to a potential cold which they can produce. How this is to be reconciled to the refrigerant power which they are supposed to exert with respect to the whole system, is not to be easily explained.

To our present purpose, however, it may perhaps be enough to say, that the stimulant operation of actual cold, which sometimes occurs, will not be sufficient to make us deny its power when longer continued, or frequently repeated, of diminishing the temperature of the body; so the stimulant power which our refrigerants frequently exert in the stomach will not be sufficient to make us doubt of their refrigerant power with respect to the whole system, which the experience of all ages has very certainly established.

Before going further, it may be proper to observe, that the substances we suppose to be refrigerant, are such as act not only by the potential cold we have alleged them to be endowed with, but at the same time by other operations that may be supposed to contribute to their general effects of diminishing the action of the sanguiferous system. These operations are their being laxative in the intestines, and diuretic in the kidneys; and we are disposed to judge their relaxing a febrile spasm on the surface of the body, to be another means of their concurring to their general effect.

Whatever, therefore, may become of our theory, or however difficult it may be to overcome the doubts above mentioned, the state of facts, from the experience we have asserted, may, we judge, be sufficient ground for our proceeding now to consider the qualities and effects of the several refrigerants enumerated in our catalogue.

PARTICULAR REFRIGERANTS.

AT the head of the list of refrigerants, I have set down *Acids*; and although these might come under some other of our general

titles, I shall here consider all their several powers and virtues, or nearly the whole of their medicinal history.

It might be expected that I should here, in the first place, enumerate all the several substances which may be, and generally are, comprehended under the general title; but this I find would be a difficult, and we hope it is an unnecessary work. The chemists of late have been discovering a great number of different species of acids that were not known before; and it is probable that their inquiries are not yet finished; but in the mean time it appears, that although it is very proper, for the purposes of chemistry, to mark and ascertain the diversity of acids, yet as few of the whole number have been employed as medicines, and that we are at least uncertain how far several of them may be employed as such, it does not seem necessary for us to take notice of any but those which we know to have been employed in the practice of physic.

In doing this, we shall in the first place mention the medicinal qualities which we suppose to be in common to all the species of acid employed in physic: and shall afterwards consider how far these qualities may be anywise different in the particular species.

Upon this plan, the quality first to be mentioned is that of their refrigerant power. This we suppose to be established by the experience of all ages; and practitioners still constantly employ them in every case in which the heat of the body is preternaturally increased; and although there may be some of the other qualities of acids which may not be suited to the constitution of certain persons, yet as to this quality there are hardly any exceptions in the cases of fevers, inflammations, and hæmorrhagies.

These effects, however, are not very evident to our senses, nor are easily subjected to experiment; because they cannot be remarkable in consequence of any one exhibition; and the effects are only found in consequence of frequent repetitions. It is proper, therefore, that we should confirm it by other observations.

One is, that any preternatural heat arising, is accompanied with thirst; which especially directs the choice of acid; and as instincts may be commonly supposed to be suited to the purpose of the animal æconomy, so this desire of acid is presumed to be a proof that these are suited to moderate the heat that is the cause of thirst.

Another consideration may be, that acids especially abound in warm climates and warm seasons; and therefore, that nature has made this provision of what is suited to moderate the heat of the human body, arising in such climates and seasons.

To all this I would add the antizymic power of acids, as this opposes the expansive force of heated blood: and as we have reason to suppose that the blood is more readily heated as it is more disposed to putrescency, so the well known antiseptic power of acids is particularly suited to temper that increased heat; and therefore, after all these considerations, there can be no doubt

that acids are particularly suited to act as refrigerants in the human body.

Another quality of acids in general is their astringent power, which we have taken notice of and explained above. This power however appears only in weak or diluted acids; for in a more concentrated state they prove corrosive, as we have also observed above. Indeed we conceive that it is especially, when their corrosive power is weakened, though still approaching to it, that another quality appears; which is, that they become painful and pretty powerfully stimulant, in so far that they are useful in some cases of palsy.

It is however to be remarked, that it is very doubtful if their stimulant power can always be in this way explained; for it sometimes appears in the operation of the weaker or more diluted acids. Thus acids may quench thirst by their refrigerant power; but it is probable also that they, by their stimulating the excretories of the mouth and fauces, pour out their fluids more copiously. I mention the stimulus of the mouth and fauces here, to introduce another consideration to be next taken notice of; and which is, that the same stimulus applied to the stomach excites appetite, and by increasing the tone of the stomach, promotes digestion.

After mentioning so much of the power and virtues of acids in general, there remains a question, what are their effects when carried into the blood-vessels, and there mixed with the mass of blood? As to this I would assert, that the concentrated fossil acids cannot be carried into the mass of blood but in such a diluted state as must destroy entirely their coagulating power, and therefore that their effects in that way cannot be supposed or apprehended.

This necessarily leads to the question, in what state are the fossil acids when mixed with the mass of blood? In answer to this we observe, but for what reasons we cannot explain, that they do not enter into the composition of the animal fluid, as we have alleged and maintained above on the subject of acid as an alimentary matter. And here we have only to observe, that as they do not enter into the animal mixed, they make a part of the serosity; and therefore, in passing with that by the excretions, they may show their stimulant power. At the same time, as a part of the serosity, they may, in passing by the skin, show there some diaphoretic effects, or, in passing by the lungs, show some irritation there; but it is probable that they pass chiefly by the urinary passages, and therefore shew their diuretic powers more readily than in any other way.

These are the effects of acids in general; and we now proceed to consider how far these effects are anywise varied in the different species.

VITRIOLIC ACID.

This is the acid that we can have in the most concentrated

state, and therefore the most fit to be employed as a caustic, or, when properly diffused, as a stimulant. For the latter purpose it is commonly diffused in some unguinous substance; as the hog's lard; but it may be more properly diffused in a liquid oil, as in this it may be more equally diffused than in the thicker matter. When it is to be employed for internal use, it must be largely diluted with water; and the dispensatories have ordered seven or eight parts of water to be added to one of the concentrated acid. The proportion of water is not a matter of much nicety: but it is proper for the sake of prescribers that it should be fixed, which, however, cannot be done without determining the specific gravity of the concentrated acid, which neither of the colleges have done.

The diluted acid is seldom employed in any precise dose, but mixed with water, or with tinctures or infusions, in such quantity as the patient's palate will easily bear. This however is a very inaccurate practice, as it generally occasions the dose of the acid to be too small. In my opinion, it would be better to fix the quantity of acid, and leave it to be diluted to what the patient's palate may require.

It has been long a common practice of mixing this acid with a quantity of spirit of wine, and in the mixture infusing some aromatics; but this is also a very inaccurate practice, as neither the specific gravity of the rectified spirit, nor of the vitriolic acid, are anywise determined. I would, however, take no pains to rectify this preparation, as I could never find the addition of the aromatic to improve the medicine; and while the practitioner is always left uncertain with respect to the quantity of acid employed, I have almost always found that this aromatic elixir was less agreeable than the simple acid.

The simple acid properly diluted, and sweetened perhaps with a little sugar, is generally grateful to the palate, and is of service in quenching thirst. When it is carried down into the stomach, it is useful in curing the nausea which arises from any putrid matters there; and either by this means, or by its stimulus applied to the stomach, it excites appetite, and consequently promotes digestion.

I have never found that, in any quantity, the vitriolic acid mixed with the bile proved laxative, as the vegetable acids so readily do. What may be its effects in the blood-vessels we have said enough when treating of the effects of acids in general.—What are the virtues of this acid in giving the æther vitriolicus, we reserve to be spoken of on the subject of antispasmodics.

NITROUS ACID.

This acid, from its being so commonly employed in chemical operations under the title of *Aqua fortis*, has probably, from the opinion of its corrosive nature, prevented physicians from employing it as a medicine. This however was a mistake; for this acid properly diluted, may be very safely employed and

has all the powers and virtues of acids in general. Though the instances are few, there is one in *Boerhaave's Nitrum Nitratum*, in which the acid is in greater proportion than is necessary to saturate the alkali; and I have frequently employed it as a grateful and cooling medicine.

There is another instance in which the acid of nitre is also employed, and that is in the *spiritus nitri dulcis*. If this was properly prepared, it should contain no acid: but this is not commonly the case, and the vulgar practitioners commonly employ it as a diuretic medicine, which it cannot be but by the quantity of acid it contains, and which therefore shows this acid to be frequently and safely employed: but it is hardly necessary to observe, that in this way it can never with any accuracy be employed.

The employment of the nitrous acid, as producing æther, shall be considered in another place.

MURIATIC OR MARINE ACID.

In the last century, *Glauber* took great pains to introduce the use of this acid, ascribing many virtues to it both in diet and medicine: but in both he was extravagant and incorrect, and therefore he has not been much followed. It happened, however, that physicians employed it a good deal in the diseases of the stomach; and many have been of opinion, that in restoring the tone of the stomach, it operates more powerfully than the vitriolic: but as the latter can be more easily brought to a standard than the other, it has entirely thrown this other out of practice. Although the London College, in the last edition of their dispensatory, have omitted both the simple spirit of salt and the *spiritus salis dulcis*, yet the Edinburgh College have retained both: and wherever the latter is employed, I consider it as an employment of the acid, for, in the ordinary preparation of it, the qualities of the acid are never entirely destroyed.

But the most remarkable instance of the employment of this acid was in the tincture aperitiva mœbii, which *Dr. Hoffman* informs us was, in the course of the last century, much employed and celebrated for its virtues. *Dr. Hoffman* informs us that it consisted of a solution of common salt supersaturated with its acid. I have frequently employed it by making a solution of half an ounce of good bay salt in four ounces of water, adding to this two drachms of a well-rectified spirit of salt; and this given in a tea-spoonful or two in a glass of water, I have found useful in improving appetite, and frequently in stopping vomiting.

VEGETABLE ACIDS.

These I am to consider as of three kinds; the native, the distilled, and the fermented.

The native acids are chiefly those found in the fruits of plants, sometimes, however, also in the leaves and roots.—They are in different degrees of acidity, and different by the texture of the fruit in which they are lodged: and still more considerably by

the various matter adhering to them, both in the fruits and in the juices expressed from these.

The effects of these different conditions in the use of them as aliments, I have endeavoured to explain when treating of them above; but, as medicines, I do not find that I can apply any distinction of them. Although they may be distinguished in a chemical view, I do not find that I can apply such distinctions to the purposes of medicine; and that, with a view to this, I must consider them in general, and merely as acids. In considering them, therefore, as medicines, I must observe, in the first place, their refrigerant power; and that, especially upon account of the quantity in which they may be given, they are the most effectual of any we can employ. As we have said above, that they enter into the composition of the animal fluid, and thereby diminish the putrescent tendency of this, they therefore, as I judge, obviate the heat that might otherwise arise; and it is in proof of all this that they are the most ready and certain cure of the scurvy.

The same acids are never in such a concentrated state as to show any caustic or even stimulant powers; but they show readily the stimulant power which is in the weaker or much diluted acids, so far as they excite appetite and promote digestion: and probably it is by the same power that they excite the urinary excretion.

All these powers are to be ascribed to the pure acid that is in this native acid of vegetables; but it is now to be remarked, that in all of them, even the most purely acid, there is present a quantity of fermentable matter: and if this happens to be in large proportion, or even in small proportion, and thrown into stomachs of an acescent disposition, the acid undergoes a fermentation, which is attended with flatulency, a more powerful acidity, and all the other symptoms which we term dyspeptic. This does not, however, much affect their refrigerant power, or do much harm to the system, except in those cases of gout and calculus renalis, in which the taking down the tone of the stomach may be very hurtful. It seems to be in consequence of this acescent disposition of the stomach, that a more copious acidity, and perhaps of a peculiar kind, united with the bile, forms a laxative which may occasion more or less of diarrhœa, and the colic pains which so frequently accompany the operation of laxatives.

DISTILLED ACID OF VEGETABLES.

All vegetables, except mushrooms, if these be truly such, when treated by distillation, without addition, give out, in the first part of the distillation, a quantity of acid, and continue to give out more during the whole of the distillation. This acid is somewhat different according as it is drawn from different vegetables: but that difference has not been ascertained: and we know them even in chemistry, and more certainly in medicine, only by the common quality of acid.

This acid has been but little employed as a medicine, and has

hardly been remarkable but by its late use in the form of tar-water. In making tar, it is exhaled from vegetables whilst they are burnt, in the same manner as in the distillation above-mentioned; and accordingly, in the making of tar, an acid water is found in considerable quantity in the same ditches that are prepared for receiving the tar during the burning of the wood. In the countries where tar is prepared, particularly in North-America, this acid was accidentally employed as a medicine. It was found to prove very useful; and the benevolent and worthy Bishop *Berkely* being informed of this, was desirous of rendering such a medicine very generally known. But as the water collected, as we have said, during the burning of the wood, could not properly or conveniently be obtained in Britain, he perceived that a quantity of the acid remained in the tar as it was imported, and perceived that it might be extracted from it by infusion in water. It is such an infusion that gives the celebrated tar-water which has been so often used since.

It was at first by many persons celebrated as a very valuable medicine; and from my own observation and experience, I know it in many cases to be such. But, as happens in all such cases, the commendations of it by the patrons and favourers of it, were very often extravagant and ill-founded; and though the persons who disparage it had some foundation for their opinions, yet they also told many falsehoods concerning it.

Although it would have been difficult, at that time, to balance between these opposite accounts, yet, in the course of sixty years, the matter has found its own balance. The excessive admiration of it has entirely ceased, and the most part of practitioners, from causes we could assign, have neglected the use of it; but there are still many judicious persons who believe in and employ its virtues. In many instances this preparation has appeared to strengthen the tone of the stomach, to excite appetite, promote digestion, and to cure all the symptoms of dyspepsia. At the same time it manifestly promotes the excretions, particularly that of urine; and the same may be presumed to happen in that of others. From all these operations it will be obvious, that in many disorders of the system this medicine may be highly useful.

It may be, however, and has been a question, upon what, in the composition of tar-water, these qualities depend: and I have no doubt in asserting that it is entirely upon the acid produced in the manner above mentioned. *Mr Reid*, the author of a dissertation on this subject, has rendered this sufficiently probable, from the accounts of *Glauber* and *Boerhaave*, with respect to the virtues of such an acid; and from the opinion of the Bishop of *Cloyne*, in preferring the Norway tar to that of New-England, as the acid part is not taken from the former so entirely as it is from the latter: and he also properly supports it by this, that any other parts of the tar-water which may be found in it, unless carefully separated, are commonly very hurtful.

Upon the first introduction of tar-water, some physicians were of opinion, that it derived part of its virtue from some oily matter in its composition. But it would not be difficult to show, that this, in many respects, is very improbable; and that, on the contrary, the presence of these oils, as Mr. Reid has particularly pointed out, is frequently pernicious. But, to supersede all controversy on this subject, I can assert from much experience, that tar-water, as it abounds in acid, and is more free from all oily matters, is the most effectual medicine: and I have this clear proof of it, that when, instead of extracting the acid by infusing the tar in water, I procured it by distillation from solid fir or other woods; and, by taking only the first part of distillation, I obtained the acid as free as possible from all oily matter, I found that by employing this acid as a medicine, properly diluted with water, every virtue appeared that was ever found in any tar-water. In this practice I found a particular advantage; as I could, by a proper rectification and concentration, bring the acid into a small bulk; which being readily portable, is, on occasion of journeys, or other circumstances, rendered very convenient. But it is very necessary to observe here, that this acid, to be rendered a very useful remedy, must be always largely diluted with water: and how much the water may favour its operation in every respect will be sufficiently obvious.

FERMENTED ACID OF VEGETABLES.

This is the well-known liquor named vinegar, the preparation of which needs not be given here. As it is found in our houses and shops, it is in different conditions, the causes and circumstances of which are not well ascertained: and we can only judge of its purity by the sharpness of its acid taste, and its being free from all others.

As this acid is prepared by fermentation, it is always in a diluted state: and, both for the purpose of medicine and pharmacy, it has been desired to be obtained in a more concentrated condition. The purposes and the execution of this are various. But the most ordinary practice has been by distillation, which seems to me not to be the most proper; for the distillation cannot be practised without the acid becoming empyreumatic, which always renders it a disagreeable medicine; and at the same time, by the ordinary practice, the acid is hardly, or not at all, rendered stronger than it might have been by a proper fermentation. The directions of the London College I could never follow with any exactness: and I have always found, that before the aqueous part be drawn off, an empyreuma is communicated to the whole liquor.

The Edinburgh directions may be exactly executed. But the empyreuma is made very strong, and at the same time the distilled acid, as I have said, is hardly stronger than it is in good vinegar: and I know of no advantage that this distilled acid has over the other.

If a concentrated vinegar is much to be desired, there are two other ways of obtaining it. The one is by freezing, which has now been frequently practised in the northern countries of Europe: and the management of it is prescribed in many books of chemistry, that I believe are in every body's hands.

The other means is by a distillation from any neutral containing this acid, by the addition of a strong vitriolic acid. This gives a very volatile acid, which, by its volatility, may be applied to several purposes: and by its being in a concentrated state it may be, by a proper dilution, applied to every purpose of medicine that the fermented acid of vegetables is fit for.

It is true that this distilled acid wants some substances which are joined with it in vinegar prepared by fermentation; and *Dr. Boerhaave* insinuates that some virtues may be derived from these. I have not, however, truly perceived them; but allow, that if there be any such advantages to be desired, they may be more certainly obtained by employing the vinegar concentrated by freezing.

After these remarks upon the different management of this acid, I proceed to consider its virtues. It is certainly a reirigerant power, which we conclude both from experience and from its antiseptic powers: and it has this advantage over the fossil acids, that it can be thrown in, in much larger quantity, and with more effect, as it enters into the composition of the animal fluid. It is grateful to the palate and stomach, and certainly stimulates the latter so far as to excite appetite. By the same stimulant power it acts upon the mucuous excretories of the mouth and fauces; and at the same time it seems to act as an astringent on the blood-vessels of these parts, and proves useful in the inflammatory affections of them. When it is carried in large quantity into the blood-vessels, a portion of it passes off by the excretions, and proves manifestly diuretic. It is celebrated also for its diaphoretic and even sudorific virtues: and these are commonly ascribed to its power of dissolving the fluids. But this, upon the general principles which will be explained hereafter, we must deny: and if it has ever appeared to have this effect, we must impute it to its refrigerant powers in the stomach, and its gently stimulant powers in the whole system, assisted by a sudorific regimen.

A singular power has been ascribed to this acid, and that is, in preventing and curing obesity, justly I believe in both cases; and I hope that I have above explained the theory of it. We have alleged that the oily matters taken into the body do not remain in their oily form; but are, in the first place, incorporated with the proper animal fluid, and are afterwards separated by a peculiar secretion, and deposited in the adipose membrane. This union of oil with the animal fluid we ascribe to the acid taken in as a part of our food: and it will be obvious, that according to the quantity of this, the oil will be more intimately united and fitted to pass off by the excretions, and leave less therefore to be

deposited in the adipose membrane. But farther, as we have alleged above, that the oil already deposited in the adipose membrane is again consumed by every acrimony prevalent in the blood; so a superabundance of vinegar in that mass may have a share in this consumption.

This is all pretty well ascertained by observations upon the large use of vinegar: but lately a new fact has been presented to us.

A gentleman disposed to obesity found, that by his abstaining from wine, which I take to be the same as abstaining from the fermented acid of vegetables, he lost his fat very considerably: but returning again to the use of wine, his obesity soon also returned, and was again removed by the same means as before. I shall not attempt the theory of this till we shall be farther informed of such cases, and more exactly with respect to the circumstances of them.

ACID OF MILK.

There is perhaps another species of vegetable acid to be taken notice of: and that is the acid which so often, and in certain circumstances, so constantly appears in the milk of all phytivorous animals. As, in the milk of the same animals, a quantity of sugar is constantly present, we may suppose it to be no other than a fermented acid of sugar. But some difficulty occurs on this subject; as the fermentation which produces an acid in milk, takes place more suddenly than we could expect it to happen in any solution of sugar; and, as was observed above, continues for a long time to increase the acidity produced. We are therefore persuaded there is something peculiar in the fermentation which produces the acid of milk. But what this peculiarity consists in, or what effects it has on the nature of the acid produced, we cannot discover. It may perhaps deserve particular consideration, both in chemistry and medicine: but we have not yet learned what application in either way may be made of it: and in the mean time can only say, that the good effects which the acid of milk can produce, and the noxious qualities it may, upon occasion, discover, are the same we have pointed out as arising from the native or fermented acid of vegetables.

A vegetable acid, prepared by fermentation, might still be mentioned, which is that of tartar. But I think it will be more properly considered under the next title of Neutral Salts, or afterwards under the title of Laxatives.

We have now mentioned most of the acids that are well known in the practice of physic. But I must own that there are many others which have been sometimes employed, and may, I believe, deserve to be enquired after. But I own that I find the facts too few to determine the matter clearly; and at least that I am too little acquainted with these facts to be able to speak positively on the subject.

Of the large list that might be mentioned, the only one that I am disposed to take notice of is the

ACID OF BORAX.

This was the invention of the celebrated *Homburg*: and as he imagined it to be possessed of strongly sedative powers, he gave it the name of the Sedative salt. Upon such an authority it was introduced into practice: and such is the favour for a new medicine, and such are the excuses so readily found for its failure, that it soon came to be much employed in France: and *Mr. Geoffroy* having found a cheaper method of preparing it, the government ordered, at their expence, that it should be furnished to all the medicine chests of the army and navy.

This certainly gave an easy opportunity of trying its virtues: but we have hardly ever had any favourable reports of these from France, or from any other country of Europe: and it appears that the practice with it has ceased every where; and long ago Mons. de la Mettrie has, in disparagement of our art, observed, *Que le sel sedatif n'est pas aussi sedatif qu'autrefois*. To all this I could add my own experience, which has shown me, that even in large doses this salt has no effect on the human body.

NEUTRAL SALTS.

The next set of refrigerants in my list are the neutral salts: and these, with acids, are certainly the refrigerant remedies we chiefly depend upon in practice. The refrigerant power seems to be in common to every neutral, so far as we have yet tried them, except those neutrals composed of the muriatic acid and fossil alkali, and perhaps some other acids which carry into the composition of neutrals some other matters of an acrid kind: but these are not well ascertained. And we take it for granted that it is of the nature of a neutral salt, composed of an acid alkali, with the exception mentioned, to give a refrigerant substance.

This power in these salts is a matter of common experience; and may be presumed from their antizymic and antiseptic powers. But in what proportion it is in the several species, is not exactly ascertained, though *Dr. Smith*, in his experiments, has done somewhat to this purpose. In the doctor's experiments it appears, that, except in common salt, some sedative power in every one takes place. In these, indeed, composed of the fossil alkali, some stimulant power appears upon their first application. But soon after this, their sedative power becomes manifest, by their destroying the irritability of the parts. After all, however, I cannot apply these experiments so far as to explain the respective powers of these salts as they appear in the practice of physic. It appears here, that all of them which show a sedative power in *Dr. Smith's* experiments, when thrown into the stomach, produce a disposition to sweat, which we refer entirely, as we have explained above, to their refrigerant power in the stomach; and in what proportion this is, I find it difficult to ascertain. The prejudices of practitioners at present are in favour of the neutral, formed of the native acid of vegetables, with the fixed vegetable alkali: and

while this is the most agreeable, I have no objection to its being the most commonly employed in practice. But I make these observations to show country practitioners, that when they happen to be in want of lemon juice, they may employ any other acid, except the muriatic, to form neutrals that may answer the same intentions: and a very little chemistry will teach them every thing else that may be here necessary. In the time of our last wars upon the continent, our practitioners frequently employed the vitriolic acid, and which was indeed employed in making the original antiemetic draught of *Riverius*.

With regard to particular neutrals, I have a few observations only to make. I have said just now, that the vitriolated tartar may be employed as a refrigerant: and as it is thereby diaphoretic, it is employed in the composition of *Dover's* powder.

The sal mirabile is almost only employed as a purgative. But that it has refrigerant powers, appears from the intestines being left, after the operation of this purgative, in a lax and flatulent condition.

What is named the secret sal-ammoniac is little employed in practice. But there is no doubt that it is nearly of the same nature with the common ammoniac.

Nitre has been commonly esteemed as the most powerful refrigerant; and from *Dr. Smith's* experiments, as well as from those of *Mr. Alexander*, it appears to be so. But as all refrigerants produce a determination to the surface of the body, and thereby increase the force of the circulation; so after the operation, they prove directly stimulant to the stomach and alimentary canal: and in this way nitre is as remarkable as any other: and it is therefore, in large doses, very often uneasy and painful to the stomach. When it is, therefore, necessary to continue its operation as a sudorific, it is at the same time necessary to give it in divided doses, and at proper intervals.

I do not doubt but the practice of *Dr. Brocklesby* may be often successful: but I could never find it convenient to imitate it; as I could hardly, or at least seldom, find a stomach that would bear half the quantity of nitre that he seems to have employed: and in most cases I have been limited in the doses of nitre that I could exhibit. I believe that the employment of nitre, as recently dissolved, will be a more powerful refrigerant than when the solution of it is entirely finished; but I am of opinion that the practice has no advantage to compensate the trouble that otherwise attends it.

I have so seldom employed the cubic nitre, that I know little of its qualities and powers.

Of the peculiar power of neutral salts, formed of the muriatic acid, I have had occasion already to remark, that by *Dr. Smith's* experiments, common salt, composed of the muriatic acid and fossil alkali, is the neutral which, applied to the nerves or other irritable parts, shows a strong stimulant power, and is

therefore to be thrown out of our list of refrigerants. Its stimulant power seems in part to be owing to the fossil alkali in its composition; for this alkali, joined with the nitrous or vegetable acids, does also, in the first application to the nerves, in *Dr. Smith's* experiments, show somewhat of a stimulant power, which however, soon passes away, and they afterwards prove manifestly sedative. These neutrals, therefore, consisting of the fixed vegetable or volatile alkali, though formed by the muriatic acid, may be taken into our list of refrigerants; and their common employment as sudorifics, for preventing the recurrence of intermittent fevers, is only to be explained upon this ground.

The use of the common ammoniac has been otherwise frequent in practice: but what are its peculiarly useful powers I dare not determine. Its resolving powers, by attenuating or dissolving the fluids, I do not admit of: but that, like other saline matters, in passing by the excretions, they are suited to promote these, may be readily allowed.

In being joined with the Peruvian bark, as has been frequently practised, the ammoniac may be of some use as a diaphoretic. But I have not perceived it; and doubt if, in obviating the consequences apprehended from the use of the bark, it can be of any service.

The ammoniacal salts have been often used externally for the discussion of tumours: and they may possibly give a moderate stimulus to the vessels on the surface, but that they enter the pores, and attenuate viscid fluids, we must very much doubt of.

The neutrals, composed of vegetable acids, must be different according to the species of this acid employed. But they are all, in general, refrigerant and diaphoretic, and we know them only in that light. The one most frequently employed, is that composed of the native acid and the fixed vegetable alkali, commonly known under the name of the Saline Mixture. The acid commonly employed is the juice of lemons: but that only because a quantity of acid juice is most easily obtained from that fruit. I have frequently employed the expressed juice from several other fruits, which the country practitioner should know in the case of the want of lemons: and I have frequently employed the juice of apples with equal advantage.

It is hardly necessary that the alkaline salt of wormwood, so frequently employed before, be now used, as the purer the alkali, the medicine is the better.

This neutral salt, formed and given in due quantity, is, for what I can perceive, equally refrigerant and sudorific as any other: and has this particular advantage, that it is, or can be, easily rendered more agreeable than any other. In my opinion, it is generally given in too small doses, and at too great intervals: and though given in large doses, it is not ready, as nitre is, to give uneasiness to the stomach. It is often named the Antiemetic Mixture, and properly; as it is often used in stopping vomiting, especially that

which arises in febrile disorders, and particularly at the beginning of the paroxysms of intermittent fevers. When given in quantity, its diuretic and purgative qualities appear as in the other neutrals.

It has been of late a favourite practice to give the saline mixture during the act of effervescence: and besides the advantages of introducing a quantity of aerial acid, I am persuaded that the detachment of that acid in the stomach renders the whole of the mixture more refrigerant.

The distilled acid of vegetables has not been employed in forming neutrals that I know of.

The fermented acid, or vinegar joined with the fixed vegetable alkali, has certainly the powers and virtues of the saline mixture. But while the neutral formed of vinegar has no advantages over that formed of the native acid, the quantity of vinegar necessary to saturate the alkali gives a bulky inconvenient dose. Whether any advantage may be gained by employing it in its concentrated states, I have not tried; because I doubt much if any peculiar advantage was to be obtained from them.

Both the native and fermented acids have been applied to the volatile alkali, to form ammoniacal salts: and I have frequently tried this with the native acid. But I never found that the ammoniacal salt had any advantage over that formed of the fixed alkali.

The application of vinegar to the volatile alkali, which gives the liquor named *Spiritus Mindereri*, has long been famous in the practice of this country. But if any thing is to be regarded in the quantity of the dose employed, this, in the doses commonly given, must be a very weak neutral. And as I have never seen any benefit from it, this, with the disagreeableness of the empyreumatic taste of the medicine, has made me omit it in practice altogether. I have known four ounces of it taken at once, and soon after four ounces more, without any sensible effect.

This, upon the notion of its being an ammoniacal salt, has been employed externally. But after what we have said on the external use of the common ammoniac, it will readily appear that the weakness of impregnation in the *spiritus mindereri* must render it much less effectual. It is very possible, indeed, that by employing a concentrated vegetable acid, we may obtain an ammoniacal neutral, of much more force than the *spiritus mindereri*: and if any one expects any particular benefit from such a combination, he must endeavour to obtain it. But from what we have said on the combination of the native acid with the volatile alkali, I cannot expect much benefit from any combination of the same alkali with the fermented acid in any of its states.

After the Neutral Salts, strictly so called, I have set down the *Sales Terrestres*; and believe that these may all be considered as refrigerants: but I cannot perceive any of them to be more powerful than the proper neutrals. Accordingly, they are little employed in practice: and if they have ever been, this in

my opinion must have been upon some false apprehensions both in chemistry and medicine.

Of the combination of acids with metallic substances, they are generally acrid and stimulant. And there are none of them that can be considered as sedative or refrigerant, excepting the *Sal Plumbi* or *Saccharum Saturni*; of which, however, I have said enough already on the subject of lead, enumerated among the astringents.

CHAPTER VIII.

A N T I S P A S M O D I C A.

THIS is the most difficult subject that has occurred to me; and I find nothing to relieve this difficulty in any of the writers who have gone before me. All of them consider it as an obscure subject, and so mysterious as hardly to be attempted. This indeed is in a great measure just: but it ought to be attempted: and we hope some light may be thrown upon it, by considering the diseases or morbid affections, for the cure of which the medicines named Antispasmodics have been chiefly employed.

These in our Nosology, in the third order of the second class of the Neuroses, are, as fully as I could, enumerated under the title of *Spasmi*: and though there is some difficulty of admitting that title in its most proper and strict sense, yet I could not well avoid it; and I have obviated all ambiguity by the character given of *Motus Abnormes*. Here also, though it may not be strictly proper, I must employ the term of *Spasmodic Affections* for the whole of the diseases I am here to consider.

In the whole of these, the state of contraction makes always the chief circumstance: and I begin with observing, that in every contraction a nervous power has a part. I own that in some phenomena the inherent power only may be concerned; but these are few and inconsiderable: for even in the involuntary motions, and especially when these are exerted in an irregular manner, it is pretty evident that there is always a concurrence of a nervous power; and in the whole of my discussions, such concurrence is always to be kept in view.

On this subject, therefore, the first consideration to be offered is, that the nervous power is always derived from the brain, or that it consists in a motion beginning in the brain, and propagated from thence into the moving fibres, in which a contraction is to be produced. The power by which this motion is propagated we name the *Energy of the Brain*: and we therefore consider every modification of the motions produced, as modifications of that energy.

With respect to these, it seems to be a law of the œconomy, that the energy of the brain is alternately excited and collapsed, or that every contraction produced is alternated with a relaxation. And the *motus abnormes*, or, as we name them, *Spasmodic Affections*, seem always to consist in the irregularity of the alternation mentioned, as they appear in spasm or convulsion.

Before going further, it is proper to remark, that these affections take place in one set of functions more than in another. Thus tetanus and epilepsy affect the animal, hysteria the natural, while palpitation and syncope affect almost only the vital functions. There is, indeed, in all violent cases some preternatural phenomena, in which all the several functions are in some measure affected: but whoever considers the diseases just now mentioned, will perceive that the affection is chiefly and especially in one set of functions only. A conclusion to be drawn from this is, that the energy of the brain is exerted differently, and often separately, with respect to the several functions, distinguished by physiologists into animal, natural, and vital. This is a state of the œconomy which has been little attended to, but is very manifest in the business of sleep and watching, and in the diseases above mentioned. See *First Lines*, from 1762 to 1765.

It is now further to be remarked with respect to the whole, that though the phenomena appear in particular parts, that is, in the organs concerned in the exercise of the several functions, the whole of them must depend upon an affection and peculiar state of the energy of the brain. It is possible, indeed, that certain motions may take place in particular parts, independent of any change in the state of the brain. But the instances of these are few and inconsiderable: and probably they cannot subsist without the brain's being brought into that state that might have induced them.

But however all this may be, it is confidently presumed, that spasmodic affections are often primarily, and always chiefly, affections of the brain. This may clearly enough appear from what has been said in general, establishing all motions as necessarily depending upon the energy of the brain. But as the proposition is of consequence, it may be proper to add some more particular proofs of it here.

One is, that spasmodic affections often arise from applications to particular parts of the body: but for the most part, the effects produced in other parts cannot be accounted for, but by supposing the intervention of the brain. Such is the case of odours and some other impressions, whose producing spasmodic affections cannot be explained otherwise, or by any consent of nerves.

The intervention of the brain, is more especially proved by this, that in many cases, the effects of applications can be prevented by interrupting the communication of the parts affected with the brain, by cutting through or compressing the nerves which form that communication.

But farther, that the state of the brain has a very special concern in spasmodic affections, the strongest and clearest proof is this, that all these affections, and all the different modes of them, can be produced by passions of the mind; which we maintain to be causes operating always first, and chiefly in the brain.

Having thus established, that spasmodic affections depend very entirely upon the state of the energy of the brain, we proceed to consider what that state may be in different cases: and we judge of them, in the first place, as they produce Spasm, strictly so called, or convulsion: and though our total ignorance of the mechanism that takes place here, will not allow us to go far in explaining it, we shall make some observations, which we hope will be useful.

In spasm there appears to be a preternatural force exerted in the energy of the brain; as appears both in the degree and duration of the contraction produced. But with a view to the general law above mentioned, it is proper to remark, that even here some alternate contraction and relaxation takes place, as I have pointed out in the *First Lines*, 1761.

In convulsion, which always consists in manifestly alternate contraction and relaxation, it appears, that from other causes than the will, the contractions are performed with more force and velocity than usual: but at the same time, as they are still such as admit of an alternate relaxation, the disease consists in an alternation's being produced more quickly than is natural. This hurried alternation we suppose to depend upon a certain state in the general energy of the brain, which may be determined by causes to be mentioned hereafter, to affect one set of functions more than another, and to produce there the spasmodic affections which these functions are liable to.

This perhaps may not appear very clear, and may be considered as hypothetical. But we suppose it may be illustrated by some further considerations. The alternation of contraction and relaxation in the animal functions is commonly regulated by the will; and therefore seems to admit some difference in the quickness of the alternation and repetition. But it is probable that that difference has its limits set to it by the animal œconomy, or at least by habit; so that if at any time it is hurried beyond the usual measure, some confusion and disorder is occasioned with the effect on the general energy mentioned above.

This seems well illustrated by surprise, or impressions unforeseen and unexpected, breaking in upon the order and velocity of the train of ideas then going on in the mind: and this we know will frequently bring on every form of spasmodic affection. Our doctrine seems also to be farther illustrated by the case of stammering; when a diffidence and hesitation interrupting or hurrying the succession of syllables or words, throws the face, and sometimes the whole body, into convulsions; which may always be avoided, by giving a measure regulating the velocity in the succession proposed, as is done by the persons attempting it in the manner of a song.

From the whole that has been just now said, we think it will appear, that convulsions may be brought on by whatever hurries the velocity of the alternations which take place in the energy of the brain.

It will illustrate the whole to observe, that as spasmodic affections thus depend upon a change in the manner and order of the motions taken place in the brain, they will occur more or less readily as that manner and order is more or less readily changed, which happens to be different in different persons. That this disposition to admit more or less readily of a change in the state, and whole of the motions depending upon the brain, is different in different persons, has been often taken notice of: and it has been as universally observed, that in persons of very great mobility in this respect, spasmodic affections are most readily excited, and do most frequently arise; which seems to confirm very much the doctrine we have delivered.

To complete our pathology as well as we can, we are next to consider what it is that determines spasmodic affections to affect one set of functions more than another. It may, in the first place, be a mobility in the energy of the brain, greater with respect to one set of functions than to another: and therefore it is that the passions of the mind, which may produce any of the spasmodic affections, do however produce them in one set of functions rather than in another.

It is possible, therefore, that the affections produced may depend entirely upon the state of the brain. But it seems also probable, that the affections produced often depend upon a conformation and state of the organs concerned in the functions to be affected, determining the energy of the brain to be directed to those parts. Thus, certain organical affections of the heart itself, or great vessels connected with it, are found to give occasion to the spasmodic affections of palpitation and syncope.

It is probable that a certain state of the lungs gives occasion to asthma; as we can so often observe, that applications made to the lungs themselves, and not to the brain, bring on the disease.

It is equally probable that a certain state of the alimentary canal, induced by a state of the ovaria, determines to the production of hysteria.

It is not easy to determine what particular state of the organs of voluntary motion should give occasion to the spasmodic affections of these. But it is probable, that as the energy of the brain is chiefly exercised in these motions, and with such a variety that we may suppose them to acquire a considerable mobility, which, joined with the constitutional condition of the same, may dispose them to be affected by any considerable change of the manner and order of the motions of the brain, and therefore to produce epilepsy, or the chief spasmodic affection of the animal functions: and that any general affection of the energy of the brain is ready to produce this, we conclude from its being one of the most frequent of spasmodic affections, and certainly more frequent than those of syncope, asthma, or hysteria.

The scope and purpose of all that we have now said, is to establish this general proposition, that spasmodic affections, whether

they arise primarily in the brain, or in particular parts, do consist chiefly, and always in part, in an affection and particular state of the energy of the brain: and the operation of antispasmodic medicines must consist in their correcting the morbid or preternatural state in the energy of the brain, by their correcting either the state of preternatural excitement or collapse, or by obviating the too sudden alternation of these states.

Before, however, proceeding to a more particular consideration of these indications, and of the remedies suited to them, which are strictly to be named Antispasmodics, I must observe, that there are remedies, though not strictly such, which are however suited to cure spasmodic affections, and therefore may occasion some confusion in the use of terms.

The first of these I would take notice of, are the remedies suited to obviate the predisponent cause of spasmodic affections. We have said above, that a certain mobility of the whole system gives strongly this predisposition: and therefore, that tonics may be fitted to obviate this: and when the disease depends upon mobility alone, these may be entirely the remedies of it. But we have seldom found them to prove truly such; both because it is difficult to render the operation of tonics sufficiently durable, or because when either the disease depends upon the state of particular parts which tonics do not change, or when it depends upon a plethoric state of the system which tonics have rather a tendency to aggravate, tonics cannot be the proper remedies. The last circumstance happens often to take place in the cases of hysteria and epilepsy.

Another means of obviating spasmodic affections, is by avoiding the exciting causes. We have said above, as well as in our First Lines of the Practice of Physic, that an occasional turgescence in the blood-vessels of the brain is one of the most frequent causes exciting epilepsy, and perhaps some other spasmodic affections. But it will be obvious, that such exciting cause must be avoided by employing refrigerants, which cannot be considered as antispasmodics.

A third case in which the proper antispasmodics may be often superfluous and useless, perhaps hurtful, is, when the disease does not primarily depend upon a state of the brain, but arises from a peculiar constitution of certain parts, which is communicated to the brain. In such cases it will be evident that the affection of the brain cannot be corrected till the primary cause is cured: and instances of this kind I have given above, as occurring with respect to particular functions.

Here I shall remark only with regard to one of those instances, as it is the best illustration of the general doctrine, and will give me an opportunity of making a particular remark with respect to it.

The instance I speak of is in the case of palpitation, syncope, and of other irregular motions of the heart. Every practitioner

knows, that these disorders commonly depend upon an organic affection of the heart, or of the great vessels immediately connected with it, as aneurism, polypus, or ossifications, which are commonly considered as incurable diseases. Dissections have indeed so commonly discovered such causes, that practitioners are very ready to despair of curing such diseases, and desert all attempts towards it: but I think it may be for the instruction of practitioners to give the following case:—

A gentleman pretty well advanced in life, was frequently attacked with palpitations of the heart, which by degrees increased both in frequency and violence, and thus continued for two or three years. As the patient was a man of the profession, he was visited by many physicians; who were very unanimously of opinion, that the disease depended upon an organic affection of the heart, as we have just now said, and considered it as absolutely incurable. The disease, however, after some years, gradually abated, both in its frequency and violence, and at length ceased altogether: and since that time, for the space of seven or eight years, the gentleman has remained in perfect health, without the slightest symptom of his former complaint.

Besides this, I have had some other instances of palpitation, both violent and lasting for some length of time: and these especially, with the instances above mentioned, persuade me that spasmodic affections, though sometimes both violent and durable, are not however always depending upon organic and incurable affections of particular parts, but may very often depend entirely on an affection of the brain alone.

Having now mentioned several remedies which cannot be strictly considered as antispasmodics, and having mentioned, though with less accuracy, the cases in which the proper antispasmodic, may be useless or superfluous: I proceed to consider those which are more strictly entitled to the appellation.

I consider them as to be referred to two heads; the one of Sedatives, and the other of what I would still more strictly name Antispasmodics, and which I would judge to be of a quality and operation different from those others.

With respect to the first, it may seem surprising that opium should not have entered into my catalogue of antispasmodics, whilst every practitioner considers it as the chief remedy in the most part of spasmodic affections. Their opinion is certainly just and true: but the consideration of its operation being often different from that of the proper antispasmodics, I overlooked the matter in composing my catalogue.

But it is now incumbent on me to observe, that as spasmodic affections are so often begun by an increased excitement of the energy of the brain; so, opium being the most powerful means of diminishing this excitement, it must very often be the most certain and ready means of both obviating and curing spasmodic affections. But at the same time we must remark, that it often

fails to answer either purpose. If the increased excitement arise from an irritation applied to a particular part of the body, to the removal of which opium cannot contribute, the disease may continue to recur, although the largest doses of opium have been employed. Thus it happens in tetanus, from wounds whose communications with the brain cannot be intercepted, that opium often fails to prove a cure.

Another case in which opium may fail, is where the excitement of the brain arises from a plethoric state of the sanguiferous system, and upon an occasional turgescence in the blood-vessels of the brain. In these cases, opium is so far from proving a remedy, that it often is a means of aggravating the disease: and this will explain why it so often fails and does harm in cases of epilepsy and hysteria.

It is hardly necessary to observe here; but as the excitement and collapse of the brain do mutually produce one another, so the spasmodic affections do always consist in some encreased excitement, yet this may be begun by a state of the collapse: and therefore, that stimulants, such as the volatile alkaline salts, or certain highly odoriferous substances of a grateful kind, may obviate the coming on of spasmodic affections.

The other set of antispasmodics, and which I hold to be properly and strictly such, appear to me to be of two kinds; one of them consisting of a set of substances of a disagreeable odour and therefore commonly named *Fætid*s, both from vegetable and animal substances. The operation of these I take to be in this way; that as all disagreeable sensations are sedative, or means of weakening the energy of the brain, so I conceive that our *fætid* medicines, by obviating or moderating the increased excitement which begins spasmodic affections, may be the remedies of these.

The other kind of antispasmodics appear to me to consist of a highly volatile oil, and which, by its volatility, acquires a singular power with regard to the nervous fluid of animals. These have manifestly the power of obviating or moderating that excitement which begins spasmodic affections, and are thereby the remedies of such. But I conceive them also to have another power, which, though I cannot explain, seems to be manifestly that of giving a tone and steadiness to the energy of the brain, so as to prevent those sudden alternations of excitement and collapse in which so many convulsive disorders consist. This may not be quite clear to my readers: and I offer it as a conjecture only, to be farther examined by speculative physicians. Whilst the nature of the nervous power and its several motions are still so imperfectly known, it seems to be allowable, with a proper reserve in the application, to enter into some speculations and conjectures.

PARTICULAR ANTISPASMODICS.

AMBRA-GRISEA.

This is a medicine so little employed in our practice, that it is

omitted in the list of both colleges. But it still retains a place in all the foreign dispensaries, and by its strong odour it promises to be an active medicine. I am, however, so little acquainted with it, that I must refer entirely for information on this subject to Dr. Lewis, who has given its natural and chemical history, as likewise the various formulæ in which it has been employed as a medicine.

SUCCINUM.

This, in its entire state, has been often employed as a medicine; but as it discovers, in that state, no active parts, and is entirely insoluble in our fluids, it must be, as it has always appeared to me to be, an absolutely inert substance: and though still perhaps employed by midwives and empirical practitioners, I believe it to be now entirely neglected by British physicians.

Much pains has been taken to obtain tinctures containing the more active parts of amber. But I have never found that any impregnations of these tinctures were considerable enough to give an active and useful medicine: and the attempt has been entirely deserted in Britain. The authors of the *Pharmacopœia Genevensis* have made an imperfect attempt in employing a large proportion of rectified spirit of wine; and the Danish and Swedish dispensaries have done somewhat better in employing the liquor anodynus mineralis, or the spiritus æthereus vitriolatus: and by these menstruums indeed some solution and extractions are made of the amber, but in these solutions I could never discover any virtues but what might be imputed to the ætherial spirits.

The only active powers that can be obtained from amber are to be found in its distilled oil and salt. The latter we have very seldom genuine: and therefore I cannot positively determine its virtues. But when genuine and well purified, they do not promise to be powerful, as I believe they differ little from vegetable acids: and the liquor cornu cervi succinatus, so much spoken of by foreign writers, I have never found to be of any efficacy, or a better medicine, than the spirit of hartshorn rendered neutral by any vegetable acid.

The distilled oil of amber is a more powerful medicine, but not in the state in which it is obtained by a first distillation; and now accordingly, in all the dispensaries it is ordered to be rectified by after distillations. This rectification, however, is variously ordered. The London college have ordered the distillation of it to be repeated three times: but unless they had ordered, that in every distillation a less and less proportion of the whole was to be drawn off, the operation may be inaccurate and very imperfect. The Edinburgh and Swedish dispensaries have done better, in ordering the rectification to be made by the addition of water in the proportion of six parts of water to one of oil: and the Edinburgh college have at the same time judiciously ordered that two thirds of the water only should be drawn off at each distillation. This indeed will give a great improvement to the oil: but I have hardly thought it enough to give it the

greatest possible purity it is capable of. I have employed several distillations with water: and have always found, that by repeated distillation the oil became of more fluidity and volatility, acquired a more agreeable odour, and proved a more powerful medicine.

It is here to be particularly observed, that all very volatile oils become medicines which have been constantly reputed to be powerful antispasmodics. And however their operation may be explained, I put the rectified oil of amber into this set of medicines, which I have found, in many cases of epilepsy, hysteria, and other spasmodic affections, to be useful. The oil of amber may be given in doses from ten to thirty drops.

It is only when amenorrhœa can be considered as part of a spasmodic affection, that the *oleum succini* shows any emmenagogue powers.

PETROLEUM.

Under this title I mean to comprehend all the fossil oils that are found in the earth: and I believe I might comprehend, in the same class, the whole of the bituminous fossils, as the asphaltum or bitumen judaicum, and pit-coal.

I believe it to be agreed among both naturalists and chemists, that the inflammable part of all these fossils is that fluid, volatile, and very inflammable oil that is named Naphtha; which is found in its separate state in some places of the earth, or upon the surface of the waters into which it has been washed out from their sides or bottoms. The production of it is not accounted for; but it is pretty certainly a fossil matter that is generated in the earth: and by the admixture of various matters it must meet with there, it puts on various forms, from that of a finer oil to a grosser, and through all the different degrees of a grosser and thicker, till it becomes quite of a solid consistence.

It is not necessary for me to prosecute the natural or chemical history of these substances here; since it is enough for the purpose of medicine for me to observe, that while they are in a separate, and in any degree in an oily or liquid state, the oil retains an acrimony that renders it stimulant, and so much antispasmodic, as to have been useful in several spasmodic affections. How far the *petroleum* is improved as a medicine, by having dissolved a portion of flowers of sulphur, I have not had experience to determine. The *petroleum*, in many of its different states, may be a medicine, as I have said. But it is always, in every form in which it can be exhibited, a very disagreeable remedy: and I have never found its powers to be so considerable as to compensate that inconveniency. The only use of the whole of the bituminous fossils that I can find worth attending to, is this, that in distillation they afford a volatile oil, of the nature of that of amber: and which, by the rectification proposed for that, may be brought to the same degree of purity and virtue, and perhaps, in some cases, at less expence.

FROM VEGETABLES.

FOETID PLANTS.

ARTEMISIA.

THIS, as a fœtid and antispasmodic, seems to be the weakest of the whole set, and justly omitted in the London list; and tho' retained in the Edinburgh, is not known in our practice.

This plant has led the learned Professor Murray to give us a valuable compilation on the subject of Moxa. But this does not seem to me to belong to this place, as it seems to be a general and not a particular remedy.

The other plant, of the class of Syngenesia, which has entered my list, is the

MATRICARIA.

This is a plant of more active parts than the former, and may deserve to be more employed than it has been. But it is not retained in either catalogue of the British Colleges: and I have seldom had such opportunity of seeing it employed as to enable me to determine precisely concerning its virtues.

CUMINUM.

The general virtues of this as a carminative and antispasmodic, I have given already: but a somewhat more disagreeable odour attending this than the other carminative seeds, has led me to insert it again here; and I esteem it to be the most antispasmodic of the whole set.

I have in my list of fœtids, inserted the pulegium, but very improperly: and I have said enough to explain my opinion of its powers when I treated of it as one of the verticillated plants.

ATRIPLEX FOETIDA.

What genus this properly belongs to, I have pointed out in my catalogue.

It is a plant of a remarkable fœtor, and may be presumed, from that, to be a powerful antispasmodic. Although it is not admitted into the list of the London college, it has been frequently employed in this country with advantage; not, however, so frequently as might be expected; and it is a plant, in its fresh state, not always ready at hand, and in its dry state it loses all its sensible qualities. It can only be employed, therefore, in its recent state: and the most convenient formula is that of a conserve; and as it is not always easy to reconcile our patients to it even in that state, it is not employed so often as I would wish.

RUTA.

The first thing to be observed with respect to this plant, is, that the herb and seeds give out essential oils in different quantities, and, as I judge, of different qualities. But as it is not marked in what different state of the plant the distillations or extractions have been made, this has produced, in my opinion, the different reports that have been given of the products obtained from this

plant, and has also occasioned some different reports of its virtues. The analysis, therefore, is to be submitted to a more accurate examination. But in the mean time, from its sensible qualities, and my experience of its use, I have no doubt in asserting its antispasmodic powers, as employed in its distilled water, in its conserve, or in its extract. The distilled water is to be taken from the plant before it has put forth its flowers, and may be much improved by a cohobation. The conserve, if made as formerly proposed, with three parts of sugar, is a weak and inconvenient formula: but if prepared with an equal part of sugar only, and made in small quantities, so that the plant may be still taken in its recent state, it is an useful antispasmodic. The extract is certainly an useful medicine, and has the approbation of both our colleges. It is possible that it may exert some emmenagogue virtues, though I have not been so successful in employing them as I could wish.

Some other virtues ascribed to Rue I judge to be in common to many other plants, and therefore take no farther notice of them here. One virtue particularly ascribed to it, that of resisting contagion, or of expelling it when taken in, I hold to be absolutely without foundation: and I hope the reasons for this opinion have been, upon several occasions, already explained.

SABINA.

This is a plant, which, of all others, gives out the greatest proportion of essential oil: and as this oil retains the peculiar odour and taste of the plant, the medicinal virtues of the whole plant may be fairly ascribed to it. But it is a very acrid and heating substance, and I have been often, upon account of these qualities, prevented from employing it in the quantity perhaps necessary to render it emmenagogue. I must own, however, that it shows a more powerful determination to the uterus than any other plant I have employed. But I have been frequently disappointed in this: and its heating qualities always require a great deal of caution.

Of its anthelmintic qualities, or of its powers in healing carious bones, or foul ulcers, I have had no experience.

GUMMI FOETIDA.

ASAFOETIDA.

I have put this at the head of the list, as the most powerful of the whole: and when it is in a tolerably recent and genuine state, it is a most valuable medicine. This depends upon the force of its odour, and upon that odour's being of a very diffusible kind, and which I believe therefore penetrates the nerves more readily than any other vegetable odour. All this explains its being a powerful and suddenly operating antispasmodic. Accordingly, I have found it to be the most powerful in all hysteric cases: and when the presence of an hysteric paroxysm prevented medicines being taken by the mouth, I have found it, given in glyster, to be very effectual. When taken into the stomach, it is particularly useful in relieving those spasmodic complaints, which so frequent-

ly attend dyspepsia: and as it has manifestly a laxative power, it is well suited to relieve the flatulent colics of hysteric and hypochondriac persons.

It is in some measure suited to relieve the spasmodic asthma. But as the spasm in these cases is of an obstinate kind, I have seldom found the asafætida of much service in asthmatic paroxysms.

As all the fœtid gums seem to be determined to the lungs, and to promote expectoration: so I have found the asafætida the most powerful for this purpose, and more powerful than the ammoniac so frequently employed.

The asafætida has been at all times considered as an anthelmintic: and I have no doubt of its being such. But I have seldom found it effectual: which, however, I impute to our not having it in so recent and diffusible a state as were to be wished.

The fœtid gums have always been commended as emmenagogues; and certainly the asafætida should have the best pretensions to this power. But whether it be owing to the imperfect state in which we too frequently have this medicine, or to somewhat in the nature of the amenorrhœa, I would not positively determine: but this is certain, that I have very seldom succeeded in employing the asafætida as an emmenagogue.

The asafætida is employed in various forms; as it may be given in its solid form, or may be extracted by either watery or spirituous menstruums, and especially as its virtues rise in distillation with those of the latter kind.

In a solid form it seldom acts as a powerful antispasmodic: and therefore, excepting where it is to be joined with aloes or other medicines, I seldom employ it.

When it is to be employed as an antispasmodic, and especially where a sudden operation is required, the form of tincture or volatile spirit are the most proper. As the frequent repetition of the same antispasmodic is ready to weaken its powers, so some variety of formulæ, and of combination with other antispasmodics, may be necessary. Of the tinctures, I take the tinctura fuliginis to be the least useful: and in my opinion, it is properly omitted by the London College.

For the purposes just now mentioned, I hold the spiritus volatilis fœtidus of the Edinburgh College, or the spiritus ammoniæ fœtidus of the London, when they can be conveniently given in large doses, to be the most powerful formulæ: but much of all this must be left to the discretion of practitioners.

AMMONIACUM.

Of all those enumerated among the fœtid gums, the ammoniac has the least of the fœtid odour: and therefore I consider its antispasmodic powers as the least considerable. It is, however, an acrid and heating substance, which, determined to the lungs, may prove an expectorant: which is the virtue commonly ascribed to it: but I have seldom found its power very remarkable: and in common practice I have frequently found the mis-

chief arising from its heating qualities greater than the benefits obtained by its expectorant powers.

The ammoniacum has been commonly commended for its power, externally applied, in resolving indurated tumors. But the theory of this is very doubtful: and I have not any clear proof from experience of its having any such power.

GALBANUM.

This is indeed a fœtid gum, and should have the virtues of such. But it is neither of a strong odour, nor of diffusible quality, and therefore its virtues are not considerable. By itself it is of little power; but is properly retained in practice, as affording the variety so requisite in the use of antispasmodics. The London College, in my opinion, have properly given a gum pill, without the asafœtida, which is so often disagreeable to particular persons. Though the Edinburgh college have perhaps given a more effectual medicine, they have missed the advantage of the variety mentioned.

The galbanum has been commended for favouring the suppuration of inflammatory tumours. But its powers in this way have never appeared to be considerable: and our surgeons have found that they can execute this business more certainly and speedily by the frequent repetition of emollient poultices.

OPOPANAX.

This is the least disagreeable of the fœtid gums, and therefore of the least virtue. In its separate state it is little employed: and properly, as its particular virtues are not ascertained. It is, however, properly retained in practice: as it affords the variety just now mentioned.

SAGAPENUM.

This is the most active and powerful of the three last mentioned gums, and has a stronger and more diffusible odour than any of them. It has therefore a better title to be retained in practice, and comes the nearest to the powers of the asafœtida; but it is not so suddenly operative and is hardly to be otherwise employed than as affording a variety.

With regard to the last mentioned gums, I have not taken notice of the various means of extracting them; as they cannot be much improved in their activity by their being treated either by tincture or distillation.

TACAMAHACA.

The common tacamahaca of our shops should not have had a place here, not being employed as an internal medicine: and as an external, I cannot perceive its virtues. There is, however, a medicine under the title of Tacamahaca in Shells, which from the accounts of materia medica writers, seems to have more active power. It was, therefore, allowable to point it out to students of materia medica, as an object of enquiry: but it is yet so little in use, that I myself have had no opportunity of being acquainted with it.

RADICES GRAVEOLENTES.

PAEONIA.

This was very anciently, and has been always since, an article of the materia medica. In our History we had occasion to give a stricture on the subject with regard to *Galen*; which does neither credit to him nor to the virtue of the medicine. Since that time, its fate and reputation have been various; while some commend its virtues, others declare their disappointment in employing it.

Its sensible qualities, in its recent state, promise some virtues. But these qualities are very inconsiderable, and at the same time very transitory; so that in the powdered root, the form in which it is most frequently employed, I can hardly perceive them to exist. In the frequent employment of them, I could never perceive any effect, either in epilepsy or other spasmodic affections. To conclude the subject, it is enough to observe, that both the Edinburgh and London Colleges have now omitted it in their lists of the materia medica.

VALERIANA SYLVESTRIS.

This is a root of more virtue and deserved reputation. It has been almost at all times in esteem, but particularly since the time of *Fabius Columna*. It has been since much taken notice of and employed in practice, frequently with success, but frequently also, particularly in my own practice, without any effect at all. The latter circumstance, however, I impute to this, that the best remedies may often fail in a disease which depends upon a diversity of causes; and partly to this, that the valerian is frequently employed in an improper condition. In the condition we have it, in different shops and at different times, I have found the sensible qualities of it to be very different: and I am persuaded, that unless it is taken up at a proper season, and properly preserved, it is often a very inert substance.

I do not conclude from its singular power with respect to cats, that it must have peculiar powers with respect to the animal œconomy. But I consider its greater or less activity with respect to cats, which is different at different times, to be a test of its active powers in general.

Its antispasmodic powers in general are very well established: and I trust to many of the reports that have been given of its efficacy. And if it has sometimes failed, I have just now accounted for it, adding only this, that it seems to me, in almost all cases, that it should be given in larger doses than it is commonly done. On this footing, I have frequently found it useful in epileptic, hysteric, and other spasmodic affections. It seems to be most useful when given in substance: and in large doses I have never found much benefit from the infusion in water.

The London college have attempted a tincture strongly impregnated: and I have attempted one still stronger, by taking the root in double the quantity, and straining the tincture by a

strong expression : and this I have found, in persons who cannot bear a large dose of the menstruum, is a powerful remedy, and suddenly operating. The volatile tincture prescribed by both colleges, is often, as suddenly operating, an effectual remedy, and gives an excellent variety of antispasmodic formulæ : but whatever may be the efficacy of the valerian, the menstruum here has certainly a share in it.

I readily believe in the anthelmintic power of the valerian, but have hardly had any opportunity of perceiving its effects.

FULIGO LIGNI.

If this had not been retained in the list of the Edinburgh college, I should not have given it a place here : and I judge it to be very properly omitted in that of the London. It is a heterogeneous mass, that has not yet been with any accuracy analysed, at least so as to ascertain its proper application in medicine : and this is especially uncertain, as on different occasions it is of different kinds.

It has been retained in the Edinburgh dispensatory, merely, if I mistake not, by the habit that Scottish practitioners have been in, of prescribing the *tinctura fuliginis* as a variety of the antispasmodic formulæ ; but it is now much neglected by them. And although we cannot deny that the soot may contribute somewhat to the intention of the medicine, yet the tincture has never shown to me any power that might not be ascribed very entirely to the *asafætida* it contains.

OLEA ESSENTIALIA.

Although these, for the most part, have been treated of before under the title of *Stimulantia*, I could not miss to give them a place here, because, as I observed above, they often exert an antispasmodic power. Their effects in this way are commonly most remarkable in the alimentary canal, and especially where spasm may be supposed to arise from some loss of tone in some portion of the muscular fibres, and when therefore a stimulus, exciting a motion in the other parts of the canal, may be the effectual remedy.

The antispasmodic power of essential oils is very much confined to these parts, and, excepting in a very few particulars, do not show their power with respect to the whole system : or, if they do, it is probably only where the more general or particular affections depend upon a state of the stomach which may be corrected by the operation of antispasmodics applied to it.

It is very generally the effect of essential oils to be stimulating and heating to the system : and therefore, when any degree of phlogistic diathesis prevails in the system, the use of these essential oils is to be avoided. Even in some cases of spasmodic affections of the alimentary canal, though some suspicion of phlogistic diathesis remain, the antispasmodic power of essential oils may seem to be necessary : but in such cases it is at least desirable to employ essential oils of the least inflammatory kind. To this

purpose, I am of opinion that the least inflammatory are the oils of the umbelliferous seeds; the next to these are those of the verticillated plants; and that the most inflammatory of all are those of the aromatics, strictly so called. But all this I leave to be farther examined, and more accurately determined; as the various qualities of the essential oils have not yet been examined with so much nicety as seems to be proper; and to this purpose a particular observation here occurs to me.

Camphire is in many respects to be considered as an essential oil: but its operation upon the human body seems to be very different from that of most others. It is a powerful antispasmodic with respect to the whole system, without being readily heating to it, as I think I have demonstrated above: and I repeat the observation here, for the sake of remarking, that several of the essential oils approach to the nature of camphire, and contain manifestly a portion of it in their composition. It may be therefore supposed, that such camphorated oils may be more powerfully antispasmodic, and at the same time less heating. Such I take to be the case with the peppermint; but whether there are any others containing so large a proportion of camphire as to give them the same qualities with this, and different from the most part of the other essential oils, I have not been able to determine.

AETHER.

This is entirely an artificial substance, formed by a combination of alcohol with a concentrated acid. For a long time we were acquainted with it as formed with the vitriolic acid only: but we have since learned, that not only the other fossil acids of nitre and sea-salt, but that also the vegetable acid, may be managed so as to form an æther, or an oil of great volatility. Although we are only very well acquainted with the vitriolic æther, all of these, formed of the other acids, seem to be endued with the same antispasmodic power: and how far this is anywise different in the different species, is not yet properly ascertained. They are employed in all spasmodic affections, whether of the whole system or of the alimentary canal: and the suddenness with which they are diffused, gives them great advantages. They are irritating and heating to the parts to which they are immediately applied, in which they resemble camphire; but resemble this also in not being heating to the whole system. They resemble that also in another respect, in being antispasmodic in the case of inflammatory spasm; and thus, by an application commonly known, they cure headach, toothach, and some rheumatic affections. Æther seems also to be endowed with some anodyne virtue; and this, ascribed to the liquor anodynus mineralis Hoffmanni, or, what I take to be the same thing, the spiritus vitrioli dulcis, seems to me to be tolerably well founded.

The only other observation I have to make with respect to æther is, that the vitriolic most commonly employed, is ready to

have some portion of the sulphureous acid adhering to it; and that, in proportion to such adherence, the virtues of it are greatly impaired. To obtain, therefore, a powerful medicine, it is necessary that great pains be taken to render the æther free from all adherence of the sulphureous acid.

OLEA EMPYREUMATICA.

The empyreumatic oil most noted for its antispasmodic virtues is very constantly taken from the empyreumatic oil of animals: and it is, therefore, in its rectified state, named the *Oleum Animale*. I think it, however, proper to inform my chemical reader, that an oil of the same volatility and antispasmodic power, as I know from my own experience, may be obtained from the empyreumatic oil of vegetables, when treated in the same manner as proposed for that of animals: and it is therefore that, in my catalogue, I chose to give the general title of *Empyreumatic*.

I do not however allege, that any particular advantage is to be got by working upon the vegetable oil; and therefore I go on to speak of this subject as it is commonly obtained from animal oils.

The preparations of this oil was formerly, and as particularly delivered by Dr. Hoffman, a very troublesome work. But succeeding chemists have found, that the purpose of the whole may be obtained with less labour and as much success. I shall enter no farther into the history of these labours, and of the various methods proposed, but to remark, that the directions given in the last edition of the London dispensatory, for the reasons given above, on the subject of the *oleum succini*, do not seem to be sufficient: and the directions given in the last edition of the *Edinburgh Pharmacopœia*, seem to be more perfect and complete. The directions given there for the preserving this oil in its perfect state, are particularly proper and necessary.

As we said above, what I believe every body apprehends, that it is very difficult to explain the operation of antispasmodics in general, I find the difficulty increases as we go farther in the consideration of particulars. Here I have occasion to take notice of a very particular circumstance in this business. We find that a very volatile oil in the several æthers, and a very volatile oil produced by the management above mentioned, from either the fossil, animal, or vegetable kingdoms, do all prove powerful antispasmodics; so it appears to me that their power is very much in proportion to the volatility, to which they are carried: for it is well known, that when their volatility, and with that their antispasmodic power, is carried to the utmost, they are again readily changed by the contact of the air: and by this their colour, odour, and volatility, are much diminished; and with these changes their antispasmodic power is also greatly impaired. Here then is a singular connection between the volatility of oil and our nervous power. But how the former acts upon the latter we do not at all perceive; and particularly, how the former, by the loss

of its volatility, is brought into a state less suited to the cure of spasmodic affections, we cannot clearly discern.

We have said above, that these affections depend upon a state of mobility in the energy of the brain: and we would now make another step in alleging, that our volatile oils give, for a certain time, a steadiness to the energy of the brain, without destroying its mobility, in the same manner as narcotics do.

But after these conjectures, I must pass from the subject, till we shall, by farther observation and reflection, learn more of the nature of the nervous power than we do at present.—In the mean time I must remark, that the speculations I have entered into, have taught me somewhat in practice; for in some instances, when I could know exactly the period of an epileptic accession, I could, by giving a full dose of animal oil, prevent such an accession. *Sed manum de tabula.*

EX ANIMALIBUS. MOSCHUS.

The production of this in an animal body, we do not pretend to account for: as we do not in the least presume, in many other instances, to account for the various and peculiar productions of the animal œconomy.

The natural history of the animal producing this peculiar substance I must leave to others; as it is of no consequence to our purpose to determine, whether it be of the goat or of the hart kind.

I would wish to enter into its chemical history: but the chemists have not gone far on this subject. It is a remarkably odoriferous substance: and this seems to depend upon what may be called an essential oil, as it arises with distillation in water. If this may be taken as a proof of the great volatility of this oil, it may be comprehended under the head of those which have their antispasmodic powers depending upon their great volatility. This, with regard to musk, must be left to farther speculation and experiment: and I must now go on in considering it as a medicinal substance in its entire state.

This I consider as entirely depending upon its being a very odoriferous matter, which in all cases seems to be powerful in acting upon the nerves of the human body. As, however, we do not yet know any certain means of extracting its odoriferous parts: so the first thing to be remarked with respect to its medicinal qualities is, that it is more effectual, given in substance, than under any preparation that has been attempted. In substance it is to be given in large doses, from 10 to 30 gr.; and even when these large doses are found to be effectual, they must be repeated after no long intervals, till the disease is entirely overcome.

While I am mentioning the doses of musk, it is proper to remark, that these will depend upon the quality of it, which is at different times in very different condition. Whether this is owing, as has been alleged, to a more imperfect condition in the original musk, or to an adulteration frequently practised upon it, I cannot

certainly determine ; but certainly such differences do occur : and I have therefore very often found it to be an ineffectual medicine. I judge of it always by the strength of its odour, and in proportion to this only to be an effectual remedy. I was once called to a patient in the night-time, under violent headach and delirium, arising from gout ; for which I ordered fifteen grains of musk, but without giving my patient any relief. In the morning, however, the disease continuing the same, as I had learned where some good and genuine musk was to be had, I ordered a like dose of this, and thereby obtained the immediate relief of my patient.—From many such instances of the difference of musk, I must inculcate upon all practitioners, that genuine musk is a very powerful medicine ; and that they should not doubt of its efficacy on any occasion, without their being certain that the failure was not owing to the imperfect state of the drug. I must add, that the imperfect state of musk is not compensated by a larger dose.

With such precaution in the choice of it, I maintain that musk is one of the most powerful antispasmodics that we are acquainted with. I have found it, with Dr. Wall, to be a powerful remedy in many convulsive and spasmodic affections, and in some of a very peculiar kind. I had once a gentleman affected with a spasm of the pharynx, preventing deglutition and almost respiration. This, when other remedies had failed, was relieved by the use of musk, which often showed its power ; for the disease continued to recur at times for some years after, and was only obviated or relieved by the use of the musk.

Some time ago the musk had the reputation of curing the bite of a mad dog. Dr. Johnston has given us two facts that are very much in favour of its power : and I have been informed of an instance in this country, of some large doses of musk having proved a cure, after symptoms of hydrophobia had come on ; but we have had no more instances of the same kind, and I leave its powers in this way entirely to the judgment of the Societe Royale de Paris.

In another disease I can vouch for the powers of musk, and that is in several circumstances of the gout. The case given by Mr. Pringle, in the *Physical and Literary Essays*, Vol. II. art. 12. is very much in favour of its virtues : and in several instances of the gout attacking the stomach, I have found it relieved by large doses of musk. I gave above an instance of headach and delirium, arising from the gout, being cured by it : and in the same person I had repeated instances of its power. This person being frequently affected with the gout, was liable to have it retrocedent, and affecting the stomach, the lungs, and particularly the head, in the manner above mentioned : and in many of these instances it was very suddenly relieved by large doses of musk, or by these at least repeated after short intervals ; tho' at length the great irregularities of this patient brought the disease into a state that resisted all remedies.

Musk has been employed by some in continued fevers; and I have had some experience of its use. It seems to be adapted to those cases of convulsive disorder which I have said above are to be cured by opiates: and indeed the success I have generally had with these, has prevented my having further experience of the musk.

CASTOREUM.

This also is an animal production, the natural history of which the public are well acquainted with. It is a pretty strongly odoriferous substance, of the disagreeable kind; and to this we ascribe its medicinal powers. It is certainly, on many occasions, a powerful antispasmodic, and has been useful in almost every case requiring such remedies, especially when given in substance, and in large doses, from ten to thirty grains. It has been supposed by some to have somewhat of a narcotic power: but I have never perceived this, excepting where such effects might be imputed to its removing the spasmodic affections which interrupted sleep. Its medicinal virtues are best extracted by a rectified spirit, as it is probable that this extracts most powerfully the odoriferous oil, upon which the medicinal quality probably depends.

The Edinburgh College are of this opinion; but the London College prefer a proof-spirit. The latter may give a medicine to be employed more conveniently in a larger dose than the former: but neither of them, in my opinion, can admit of doses of much efficacy. Either of them may give a medicine to be suddenly diffused, and therefore of use in spasmodic affections, but if that be the intention of the practitioner, it will be most certainly obtained by employing the compound tincture of castor, as prescribed by the Edinburgh College.

SALES ALKALINI VOLATILES.

These should have been put above, under the head of Stimulantia; for their stimulant is their most remarkable power; and this they show in every dose, wherever the energy of the brain is weakened, and in consequence the action of the heart is languid, or requires to be accelerated. In such cases this stimulus is among the safest, as it is always transitory: and when their acrimony can be covered, so as to pass the mouth and fauces without irritation there, they may be given in large doses, from ten to twenty grains.

It is not necessary to observe, that these volatile alkaline salts were formerly drawn from various animal substances, and supposed, in consequence, to have peculiar virtues. But now the chemists have learned, that from whatever substances they may be extracted, they may be brought to such a degree of purity as renders them hardly different from one another.—They are still, however, prepared in two different ways; the one of which is from sal ammoniac, which gives the ammonia of the London Dispensatory, or the sal ammoniacus volatilis, and spiritus salis ammoniaci of the Edinburgh.

These are certainly the purest forms of the volatile alkali, the most free from any adhering animal substances. But while the trade continues of preparing a volatile alkali from the bones or other solid parts of animals, there will come into our shops a salt and spirit that can hardly ever be so pure from some empyreumatic animal substance adhering: and it is a question with me, Whether such an adherence may not give some peculiar quality to the salt and spirit? I believe it does so, and may render it more antispasmodic. This, indeed, cannot go far in any doses of the salt or spirits given to adults: but it may go much further as employed in the antispasmodic affections of infants.

The liquid volatile alkali is commonly employed in its mild state: but by a distillation of the sal ammoniac with quick-lime, the alkali obtained may be in its caustic state.—In this state it may be readily joined with spirit of wine, and gives the spiritus salis ammoniaci dulcis of the Edinburgh Dispensatory, or the spiritus salis ammoniaci vinosus of the London. The combination affords an excellent menstruum for dissolving the several fœtid substances employed as antispasmodics; and renders them more suddenly diffusible, and perhaps of more effect, in all spasmodic affections.

The caustic volatile alkali is seldom employed by itself: but if its acrimony be covered while it passes the mouth and fauces, it may be employed with great safety. Its chief use, however, is when employed externally; and when smelled at the nose, it gives a more powerful stimulus than the mild alkali can do. Its acrimony is so considerable, that when applied to the skin, it readily irritates, and even inflames it; and may be so managed as to prove an useful stimulant and rubefacient in many cases. But this requires its being blended with a mild expressed oil, in such proportion as to prevent its inflaming too much: and in this state it may be employed with great advantage, and particularly in paralytic cases, with more advantage than the acids we mentioned before for that purpose.

Practitioners are now well acquainted with the use of this combination, under the name of the Volatile Oil, and find it useful in relieving all pains arising from rheumatism, when the skin is not already affected with redness: and it is even useful in relieving pains of the flatulent kind. This combination, to be very useful, requires to be made of one drachm of good caustic alkali to an ounce of the oil: and it may even go, frequently with advantage, to double that quantity. Let apothecaries observe, that if the alkali does not entirely and intimately unite with the oil, and remain constantly united with it, it is a mark that the alkali was not sufficiently caustic.

Of the Action of Medicines upon the Fluids.

Having now considered and explained, as well as we can, the action of medicines upon both the simple and living solid, I am

next to consider the action of medicines upon the fluids of the human body.

The subject has occupied a great part of the writings on the *materia medica*; but, in my opinion, with no advantage.—The doctrines have been often drawn from mistaken facts; from an imperfect view of things; and commonly explained upon mistaken principles. Whether I shall be able to correct and improve this doctrine, I dare not determine: but it seems necessary to attempt it; and I shall do it as far as I am able.

The principles I am to employ, are, perhaps, very well understood by some chemical philosophers: but they are still far from being understood by the most part of physicians in any country of Europe, and particularly very imperfectly understood by writers on the *materia medica*. It seems, therefore, necessary to lay down the principles I am now to proceed upon; allowing them to be corrected and improved hereafter by abler philosophers.

The leading principle to be employed is this, that the qualities of bodies, as they appear to us, are especially changed by separation or combination; that is, by the separation of mixts into their constituent parts, which in their separate state have qualities different from those which appeared in the mixt; or by the combination of two or more separate bodies, into a mixt or compound, which has qualities different from those which appeared in the separate parts.

All this is, in general, obvious; but in order to explain the latter case, we must now observe, that nature has established between the small parts of bodies, an attraction, as it is called, or a disposition in a certain contiguity, to run into an union with one another, and to remain firmly united together.

This disposition, or this attraction, does not however take place between all kinds of bodies; as there are many which have no such relation; and of two bodies, which have each of them an attraction to a third, the force of this is stronger with respect to this third body in the one than in the other, which is called an *Elective Attraction*. It is by this especially, that the separation of the constituent parts of mixts is obtained; as when to a mixt body, another is applied which has a stronger attraction to one of its constituent parts than they have to one another, the part having the strongest attraction towards the body added, passes to that, and leaves the other with which it was formerly joined, by itself: and thus the constituent parts of a mixt may be separated from one another, whilst a new combination is at the same time formed.

To explain the separation of mixed bodies, it is further necessary to remark, that the constituent parts of a mixt may be separated from one another by the action of heat or fire: and taking this into the account, we have all the several means of changing the qualities of bodies by separation and combination.

In this view of the matter it will appear, that, beside the action

of fire, the only other power in nature by which the qualities of bodies are changed, is the relation of attraction which nature has established between different bodies. What that relation depends upon, we have not, so far as I know, in any measure perceived. The smallest ultimate parts of bodies we have not, in any case that I know of, had a sight of, so as to show us any properties or conditions that might account for their several attractions, or their repugnance to it, which we call their repulsion. The suppositions of the Corpuscularian philosophy have been gratuitously assumed; and might perhaps be shown with respect to particular bodies, to have been universally false.

The late discoveries, showing acids to appear often in the form of an air, should, I think, disturb the notions of the Corpuscularians. In short, the Corpuscularian doctrines have never explained to me any one phenomenon of nature: and it appears to be full time for us to give up our assuming them in our explanation of the qualities of bodies.

Some changes in the qualities of aggregates may be obtained by a mechanical division: but mechanical division divides aggregates only into their integrant parts. And I know no instance of such division separating the constituent parts of any mixt that takes place in the ultimate or smallest parts of the aggregate. If mechanical division seems to change the cohesion of aggregates, I maintain it to be always by some relation of attraction operating by solution or mixture.

It must in the next place be observed, that where bodies are to be changed by the combination of two different bodies, a certain proportion of the one to the other is always necessary to make any considerable change in the qualities of the new mixt: and if the portion of the one be very small with respect to the other, though this may be equally diffused over the whole, yet the changes, in the former qualities of the larger portion, may be very inconsiderable, or hardly assignable. When, therefore, a quantity of matter, small with respect to the whole of the fluids of the human body, is introduced into it, no considerable change can be made in the larger mass: and this is a doctrine we shall have frequent occasion to employ.

It is, however, to be remarked here, that whenever it appears that a portion of matter, small with respect to the whole of the human body to which it is added, has very considerable effects in changing the state of it, that this must be either by the matter's acting primarily on the nervous system, which may be moved by very small quantities of matter, or that it must be by the matter's acting as a ferment; which, by acting successively on the several parts, may at length make a considerable change in the whole mass.

Having thus laid down my general principles, I proceed to treat of the several medicines acting upon the fluids, under the several titles to which I have referred them in my catalogue. I might, as is usually done, and as I have done in my general ta-

ble, mention them as *Alterantia* and *Immutantia*, or as *Evacuantia*. But as I have no proper doctrine to deliver under the general head of *Alterantia*, I proceed to consider the particular state of alteration as the several conditions of it are explained in my general table, and in the detail of my catalogue.

CHAPTER IX.

D I L U E N T I A.

THE fluidity of the blood may be increased in two ways; that is, either by increasing the proportion of fluid in it; or by diminishing the cohesion of the other parts. It is the first for which we employ strictly the term and title of *Diluentia*; and the second we are to consider in the next chapter, under the title of *Attenuantia*.

With respect to the first, it is well known that the ordinary fluidity of the blood is owing to water, which in great proportion is constantly present in it; and that the chief, and perhaps only, means of increasing its fluidity, will be by increasing the proportion of water in it. We take it for granted, that the blood, in the state in which it is in living bodies, will always readily admit of a further proportion of water to be uniformly diffused in it, and thereby to increase the fluidity of the whole. And we cannot indeed discover that any other fluid can have this effect, but in proportion to the water which such fluid contains. Water—therefore is the proper, perhaps the only proper, diluent; and its effects, as such, I am now to consider more particularly.

AQUA.

This I formerly considered as a drink, and am now to consider as a medicine: and in this light some have justly considered it as very universal. We formerly mentioned the several qualities of water necessary to render it fit for a drink: and it seems to be enough to say now, that the same qualities precisely are what render it fit to be employed as a diluent; and as such I proceed to consider its operations.

Nature having appointed water to be universally the drink of the whole animal creation, it is therefore in man the proper object of thirst: and its first operation is to quench this appetite, and thereby remove a very uneasy sensation, which is often a considerable irritation of the whole system.—It does this, not only by its coolness and simple fluidity, but also by its diluent power in dissolving the viscid matters of the internal mouth and fauces.

When water is carried down into the stomach, it has there, according to its temperature and quantity, a very various operation. The effects of the former I have mentioned several times; to be therefore no further taken notice of here: and they are the effects of its diluent power only which I am now to consider.

As the most part of mankind take drink along with their solid

food, there can be little doubt that a certain portion of diluent drink, and particularly water, favours the solution and digestion of our solid food, and also contributes to the more speedy evacuation of the stomach. The quantity necessary for this is very different in different persons, and must be suited to the feelings of every individual; but with this observation, that a larger proportion than necessary, by increasing the distention of the stomach, is ready to take off what appetite might otherwise remain: and it is commonly proper only, after the digestion is over, to throw in a quantity of water to finish that business more completely, and to promote the entire evacuation of the stomach.

Not only for the assistance of digestion, our diluent is necessary, but is also otherwise to the state of the stomach itself. As the mucuous glands of this organ throw out a large quantity of a heavy viscid fluid, which, remaining in the stomach, gives an uneasy sense of weight, and impairs the appetite; so, in this morbid state, a quantity of water, by diluting and favouring the absorption and evacuation of this mucus, may often be the most certain remedy.

It will be obvious, that in consequence of these operations, many and various disorders of the stomach, and of the whole system, may be removed by water taken into the stomach.

When water is carried into the intestinal canal, it will, by mixing with the bile, diminish the acrimony of this, and obviate irritations that might otherwise have thence arisen. By diluting the contents of the intestines, it will certainly promote the more entire solution of these, and even by its bulk, favour their progress. But it is to be remarked here, that as water is intended to be copiously absorbed here; so the effects we have just now mentioned will always be less and less as the alimentary mass goes farther on, and will thereby allow it to come to a thicker consistence; which will perhaps explain why the drinking of water so commonly contributes to a costive habit. At the same time it is to be remarked, that a large quantity of water, pretty quickly thrown into the intestines, may, by its bulk, increase their action, and thereby prove laxative. And I have known many instances of water operating in this way proving an useful remedy, by clearing out the whole of the contents, whether natural or morbid, which might be stagnant there. The common people, who commonly take in every thing that is under the name of a mineral water in very large quantities, often obtain much benefit from waters of no sensible impregnation, or at least of such impregnation as would have no effect, if it was not from the bulk of water which accompanies it.

When any unusual quantity of water enters the lacteals or other absorbents, it must contribute to increase the fluidity of their contents, and to expedite their motions: and considering how much obstructions in the conglobate glands are to be apprehended, the increasing the fluidity of the liquor passing them may

often be a means of obviating these obstructions, or removing them when formed.

The water entering the blood-vessels by the thoracic duct must, in proportion, increase the fluidity of the whole mass, and is certainly the means by which its fluidity is commonly preserved.

It is true, that even an unusual quantity of water entering the blood-vessels, enters so slowly, that it can hardly, before it be again withdrawn, increase the bulk of the whole, or give any unusual distension. But the size of the vessels is commonly so exactly adjusted to the quantity of these, that I am persuaded any unusual increase in the quantity of fluid, though very small, may give some degree of distension, and in some measure invigorate the system.

This, however, in healthy bodies, or such as are without any obstruction of the excretions, cannot long subsist; for I hold it to be true, that any unusual increase of the quantity of water in the blood will immediately pass off by one or other of the excretions: and this passing off very immediately and largely by the excretions, we are now to consider as a principal effect of water taken in.

When an unusual quantity of water has been thrown in, and passes off largely by urine, as it commonly passes off almost without colour, taste, or smell, it may be supposed that it carries little of the saline matter of the blood along with it. This, however, cannot be supposed to be entirely the case; but that water, in this way, in some measure diminishing the saline matters formerly present, may thereby obviate and contribute to the cure of several diseases; and further, although in this way its operation should not be considerable, there is another effect of it to be taken notice of, which is, that the exciting and increasing the action of the secretory and excretory vessels must always be of considerable use to the system.

One other remark is to be made.—Although it is probable that, by the constitution of the æconomy, any unusual quantity of water may be determined to pass off by the excretions, rather than by the internal exhalants, this can hardly be supposed to be so entirely the case, but that some portion of the abundant water will also pass by the internal exhalants, and thereby, in some measure, dilute the ordinary halitus and the lymph that is absorbed from it. By this means the diluted lymph will pass along its vessels, and be fitter to obviate stagnations that might otherwise occur there. And whether, in this way, the large use of water may not contribute to the cure of scrophula, I leave my intelligent readers to determine.

From this detail of the operation of water, when joined with the effects of its temperature, explained elsewhere, it will readily appear that the abundant use of it, with very few exceptions, may be considered as a very general means both of preserving health and of curing diseases.

After *Aqua*, in my catalogue, I have set down the *aquasa blanda*; by which I mean all those fluids whose parts are chiefly water, without the addition of other matters that may either diminish the diluent qualities of it, or give it peculiar properties: and with these conditions I hold, that all aqueous liquors may have all the powers and properties I have ascribed to simple water.

CHAPTER X.

ATTENUANTIA.

THESE are medicines supposed to increase the fluidity of the mass of blood, and that without increasing the proportion of the water in it, but by an operation upon the other parts of the mass.

The employment of this class of medicines seems to me to have proceeded upon the supposition that the preternatural spissitude of the fluids is owing to the small parts of them uniting together, and thereby forming grosser and more impervious masses.

This state of the fluids is supposed to be corrected either by mechanical or chemical means. The first, it is supposed, may be done by a matter attenuating or diminishing the size of the preternaturally grosser particles, or by a matter which divides and separates the parts of these; and these last are named Incidentia, a term frequently occurring in writers on the materia medica. On the subject of these operations of attenuating and incidenting, I would in the first place observe, that the supposition of the cause of the preternatural spissitude of the fluids is upon a mistaken foundation; and I am disposed to maintain, that there is no evidence of its ever taking place. Secondly, Though the supposition was better founded, I maintain, agreeable to the principles above laid down, that no such mechanical operation can here take place. But, without entering farther into the question, I choose to quote the following passage from the learned Gaubius. Altho' he was bred in the Corpuscularian school of *Boerhaave*, and has himself, in other parts of his work, admitted much of that doctrine, he had certainly entertained some doubts of its truth and propriety; and with respect to one particular of it, has given us the following passage. In the 300th paragraph of his pathology he has the following words: "*An et naturæ humanæ facultas inest, moleculas, acres, detritis aut intropressis angulis in spherulas tornando blanditiem creandi? Non satis constat speciosam ideam æqualiter in fluidam solidamque acrimoniam quadrare. Credibilius profecto mixtione chemica (298) magis quam mechanica rotundatione id opus perfici.*"

I dare say, the opinion of the mechanical operation of the attenuantia and incidentia will be deserted by every body: and we have therefore only to consider how their effects may be accounted for in a chemical way. Here, however, we meet with much

difficulty. The change that happens in consequence of the exhibition of those medicines, if any at all, cannot be rendered evident in fact; and the theory of any supposed operation is not to be readily explained. What can change the state of the gluten is not well known: and we do not know of any matters applied to it out of the body that can dissolve it, except a caustic alkali, which cannot be applied to it as it flows in the vessels. Saline matters as applied to it, when it is drawn out of the vessels, do prevent its usual concretion. But these have no effect upon its consistence; for, on a quantity of water being added, the gluten separates from the rest of the mass, and shows the same qualities which it would have done upon any other occasion. I must say the same thing of the red globules, that we do not know of any substances, which, in the body or out of it, can change the state of these; and therefore we do not know of any substances which can change the consistence of the blood with respect to the principal parts, which we might suppose to be the most ready to form preternatural concretions. If, therefore, any such take place, it must be in the serosity. But whether ever any such concretions take place there, is not ascertained as a fact: and the supposition is not suitable to what we know of the serosity, which is always a saline fluid, possessed of a solvent power with respect to the other parts of the mass of blood.

But however all this may be, if we can suppose that there may be concretions, or a disposition to concreate, there may be room for attenuating medicines: and I have set down a list of medicines supposed to be of that kind.

Of these, the first I have set down is water, which perhaps need not have been repeated here; but I mention it to say, it is probable that this not only increases the proportion of water which is always separate from the animal fluid, but that a portion of it may insinuate itself into this, and be a means therefore of diminishing the force of cohesion in it.

The next in my list are the

ALKALINA.

Supposed to be powerful attenuants: but this does not appear to me to be on just grounds. It was originally supposed that they operated by their septic powers. But the experiments of Sir John Pringle have entirely exploded this opinion: and as to their otherwise solvent powers, I have already observed that with respect to the gluten, they are none at all: and if they act at all as attenuants, they must act merely by increasing the saline state of the serosity, and therefore in the same manner as the matters I am next to mention do.

SALES NEUTRI.

These have been universally supposed to be attenuant, but on no certain foundation that I can discern. They may, as I have said already, be employed in preventing the usual concretion of extravasated blood: but in no experiment do they show any pow-

er in dissolving or moderating the cohesion of the gluten. I have allowed that the saline state of the serosity has a chief share in preserving the fluidity of the whole mass: and when the saline matter is in large proportion present, it may give an unusual fluidity to the whole: but I cannot perceive that any such quantity of neutral salts that are commonly employed as medicines, can have such an effect. An ounce of nitre, thrown in *par reprises*, in the course of twenty-four hours, while a portion of it is at the same time constantly passing off by the excretions, cannot possibly be ever accumulated in such quantity as to have any effect as a solvent. In the same manner I reason with respect to the other neutrals: and I proceed to consider the next article of

SAPONES.

Boerhaave was much disposed to extend the idea annexed to this term, seeming to suppose that every combination of saline and oily matters might be considered as a soap. As such a combination, however, takes place in almost every natural production, whether vegetable or animal, it is obvious, that as the qualities and proportions of the ingredients of such mixts must be considerably diversified, the chemical qualities and effects of them upon other bodies must also be so; and therefore the language of saponaceous must in chemistry be loose and inaccurate: and the use of it in medicine must be in the same condition. As incapable of precision, it should not be employed so promiscuously and commonly as it has been done.

For the purpose of the materia medica, we must aim at more precision; and I am here to consider only what comes most commonly and strictly under the appellation of Soap, which is a combination of fixt alkali with an expressed oil. The preparation of this has been so frequently described, and is so well known, that it need not be delivered here: and with a view to its chemical or medicinal qualities, it is enough to say, that it consists in such an exact and mutual saturation of the two ingredients with each other, that a new mixt is formed, in which the qualities of the constituent parts very entirely disappear. The alkali loses the acrimony which it had in its separate state: and the oil now becomes readily miscible with water, which it was not at all before: and the perfect state of these properties is the mark of the preparation's being accurate and exact.

The medical consideration of this substance first to be entered into is, that soap is ready to be decomposed by any acid, however weak: and this circumstance, in the quality of soap, is of great weight in our judging of its effects in the human body. As in our opinion the human stomach, in its healthy state, is never without some acid present in it; so it is probable that any moderate quantity of soap taken into the stomach is always decomposed by the acid of this cavity applied to the alkali of the soap: and this goes so far, that when acidity to a morbid degree prevails in the stomach, there is not a more powerful corrector can

be applied to it than soap: and it is often a more convenient remedy than common absorbents or simple alkalines.

When soap is thus decomposed, what effect either the neutral formed from it, or the oil separated from it, may have in the stomach, hardly deserves any attention: and what are the effects of its correcting the acidity of the stomach shall be considered hereafter.

Upon the supposition that soap is not decomposed in the stomach, or that such a quantity is thrown in as cannot be entirely decomposed there, it may be an object of enquiry to determine what are its effects in different parts of the system. As under a certain management, soap may dissolve the most part of vegetable or animal concretions, a specious foundation has been laid for supposing its attenuant power with respect to the human fluids: and very possibly it may be of use in resolving the viscidities that may be supposed to occur in the alimentary canal; though, considering the diluted state in which it must be applied, its operation cannot be very powerful; and this will apply more strongly with respect to its effects, as it proceeds farther in the system.

In the intestines it has been supposed to be a laxative: but except when taken in very large quantity, I cannot perceive its operation. When it does happen, it must be owing to the common salt that is employed in its preparation, and which in part adheres to it: for when this is separated, the soap becomes a perfectly mild substance, not likely to give an irritation to parts of the greatest sensibility.

It has therefore been a frivolous practice to employ soap as a laxative in gylsters. It may perhaps be of some use in softening hardened fæces. But as a stimulus it can act only by its common salt: and a quantity of this may always be added with less trouble than the addition of the soap.

When soap is carried into the blood-vessels, it may be supposed to have some attenuant power: but I must hold this to be very doubtful, and it can never be considerable. When we consider that it cannot be thrown in, in any large quantity, and that only in some length of time; and when taken in, as it is much divided and diffused over the whole mass of blood, we cannot suppose it to be in any part of this mass in such quantity or concentration as could have any effect in resolving viscid concretions, even out of the body: and therefore we must hold the so-much talked-of power of soap, in resolving obstructions, to be very insignificant.

While it has been supposed that soap may be of use in resolving obstructions of the liver, it has been a consequence of that supposition, to judge that it may be useful in jaundice; and as useful in that case, it has been universally recommended by materia medica writers. I imagine it, however, to be upon a slight foundation. The arguments I have employed against the re-

solving powers of soap, lead me to think, that it cannot resolve biliary concretions, which it does not even out of the body: and in persons frequently liable to such concretions, I have known the soap employed without any effect. When a jaundice is actually produced by a biliary concretion falling down into the biliary ducts, that soap can do any thing towards dissolving or pushing on that concretion, is not in the least probable. It is therefore that it has been unreasonably recommended in jaundice. But I have frequently employed it; and by its correcting the acidity of the stomach, and in some measure obviating the argillaceous consistence of the *fæces*, I have found it useful.

I must not dismiss the consideration of the internal use of soap, without acknowledging that it has often appeared to be useful to the system: but it has only appeared to me to be so in calculous and gouty cases, which I ascribe entirely to its correcting the acidity of the stomach; the explanation of which has been already hinted, and will be more fully considered in the sequel.

Nothing has been more frequent than the commendation of soap for external use; and as it is commonly employed, it seems to be well founded. We spoke above of the great benefit of friction employed by means of oil: and as soap also affords a convenient medium, so the friction employed with this is often a powerful means of resolving various obstructions on the surface of the body, and at the same time of the subjacent parts. At the same time, as it is convenient enough for admitting the antispasmodic power of camphire, and the stimulant and rubefacient power of essential oils, we may readily perceive that soap very properly forms the basis of some powerful external remedies.

DULCIA.

In entering upon the consideration of sugar, which I have before represented as an alimentary matter, it naturally occurs to us to remark, that a choice of diet should be the most obvious and certain means of giving the proper consistence, or the other necessary qualities, to the mass of blood. This appears to be just: but the application of it is not so easy as might be imagined. The blood of the phytivorous animal hardly differs from that of the carnivorous; or, at least, the difference has not been clearly ascertained. What we are more certain of, is, that men live upon very different aliments, and at the same time produce blood of no apparent diversity. This also is perhaps not exactly true: but I maintain that physicians have not yet learned to mark the different states of the blood in men of ordinary health. This will readily appear from the accounts that have been given of it. See Halleri *Elementa*, lib. v. sec. 2. art. 8. and consider what we have said above, *Introduct. chap. I. art. 2.* From all which it will appear, that we are not in a condition to determine the effect of aliments upon the state of the blood. It is probable that they give some difference: but it is at the same time pro-

bable, that the different state of the blood depends more upon certain differences in the general œconomy than upon the diversity of aliment.

I proceed therefore to consider what may be the effect of sugar, and of saccharine matters, when taken into the body in large quantities. I hope, that when treating of aliments in general, I sufficiently proved that these matters enter largely into the composition of the proper animal fluid, and make a part of the nourishment of the body: and from the facts adduced, it is highly probable that they may be taken in with perfect safety in very large quantities: and in proof of this, many extraordinary facts are adduced. What limits may be set to this, is with me very uncertain: but we shall allow, that there may be limits in this respect; and that whenever it happens that more sugar is taken in than can enter into the composition of the animal fluid, it must remain in its separate state, and may then be considered as a medicine that may have particular effects on the whole of the fluids.

Upon this subject it has been commonly supposed that sugar is an attenuant: that is, increases the fluidity of the whole mass, and may obviate and resolve concretions that might or do actually happen in our fluids. It may be so: but there is no proof that I know of, given of the fact: and there are no experiments made out of the body that support the opinion. Its antiseptic powers fully established, are against the idea of its being an attenuant. What effects it may have, when very largely introduced, or when generated in unusual quantity, in the singular case of diabetes, I dare not determine. The noxious qualities that have been ascribed to it, are neither clearly proved nor ascertained: and the experiments of the late ingenious and industrious Dr. Stark do not appear to me to be anywise complete or conclusive.

It remains therefore still to say what are the medicinal qualities of sugar, when present in any unusual quantity in the mass of blood. It appears to me that they are no other than that of a mild saline substance, that will readily pass off by the excretions, and probably expedite and promote these: and this is the only medicinal virtue I can ascribe to it.

On the qualities of sugar, it was hardly necessary to observe, that in certain stomachs it may be disposed to an acescent fermentation: and when, from the state and circumstances of the stomach, this happens to be in excess, sugar may have all the effects of other acescents.

When sugar is carried unchanged into the intestinal canal, it seems to stimulate this, and prove laxative: and the use of it in glysters is in proof of this. But when taken in by the mouth, its laxative effects hardly appear, except when it is taken in large quantity; and then indeed the laxative quality of sugar appears to be considerable. I am of opinion that it is most commonly from its having been brought from the stomach into the intestines in an acid state, and when therefore, like other acids, being mixed with the bile, it may like those others induce a diarrhœa.

MEL.

This is so exactly and entirely a sugar, that I am at a loss to find in it any qualities or virtues different from those of sugar. It may commonly have somewhat more viscid adhering to it; but what effect this has upon its qualities, I cannot perceive: and whatever they are, they may be taken away by clarifying with white of egg.

Recent honey has a matter in it which in certain persons readily excites an acescent fermentation and spasms of the stomach which are called Colics. What is the peculiar matter here present, we cannot discern: but it seems to be volatile; as it is readily dissipated by boiling. The effects of the recent honey we speak of, do not take place in every person, and in those only of a peculiar idiosyncrasy: and to such persons honey should not be given without having been boiled.

As I have said that the medicinal qualities of honey are not different from those of sugar, there is no foundation for what might have been necessary in ancient times; that is, for making honey the basis of syrups. The London College still continue the practice; but for what purpose in medicine I cannot conceive. In my opinion, the Edinburgh College have properly laid it aside, for several reasons. Our country apothecaries would not always take the trouble of clarifying their coarse honey: and fine honey is almost always dearer in this country than sugar.

I have said, that I do not know any difference of medicinal quality in sugar and in honey: but I am not positive in this; for I have had some reports of benefit obtained by certain asthmatics from the large use of honey: and if it be possible that honey is in any measure disposed to go by the exhalents of the lungs, there may be a foundation for this; but it is not yet ascertained that sugar taken in the same quantity would not have had the same effect. In some of the instances reported as above, the honey was taken to the quantity of several ounces every day.

GLYCYRRHIZA.

This is a well-known root, which affords a large proportion of saccharine matter: and when that is abstracted by itself, it does not differ from common sugar, and therefore does not differ from it in any of its medicinal qualities.

This is particular with respect to it, that besides its sweet substance, it contains a bitterish disagreeable matter, which, however, is only extracted by long boiling: and this therefore directs, that to obtain the sweet, and avoid the bitter, the liquorice should always be treated by slight and short boiling. This practice is now commonly established: and I mention it only to take notice of what has been much observed, which is, that while all other sweets excite thirst, liquorice takes it off, and was therefore anciently named *Adiπic*. To explain this, I observe, that in the sweet of liquorice, separate from the root, I do not find that it quenches thirst more than other sweets: and I take the mista-

ken notion to have arisen from this, that if a piece of the root be chewed till the whole of the sweetness is extracted, further chewing brings out the acrid and bitterish matter, which stimulates the mouth and fauces so as to produce an excretion of fluid, and thereby takes off the thirst which the sweetness had produced.

I have only further to repeat, that as the sweet of liquorice is no other than that of sugar, so we can ascribe no other medicinal qualities to it. It is alleged that it has some mucilaginous matter joined with its sweetness, by which it may be a more powerful demulcent than sugar: but this we shall have occasion to consider further under the article of Demulcent.

FRUCTUS DULCES SICCATAE.

I thought it proper to mention these here among the dulcia; and I think properly enough: as they contain a large proportion of sugar, and have every property of this. I do not, however, allow them to have any more attenuating powers than sugar itself. But some of them seem to have more of a mucilaginous matter mixed with their sugar, and may therefore have a more demulcent quality, as we shall say by and by.

CHAPTER XI.

INSPISSANTIA.

IF it had not been in complaisance to the common system, and to give a seeming consistence to my own, I should not have inserted this title; for I do not know the application of it in the practice of physic. If the general consistence of the mass of blood is to be increased, I do not know any other means of doing it than by diet and exercise: for I do not know of any medicine that can give a more dense consistence to the animal fluids, or a greater proportion of the denser fluids to the whole.

I have set down here two substances which may increase the cohesion of the parts: but I think they cannot be introduced so as to have any such effect: and I have set them down here merely to obviate a mistake that might arise with thoughtless chemists, who might imagine that every portion of these fluids might have some tendency to coagulate or thicken the mass of blood. It is however certain, that neither acids nor alcohol, except in their very concentrated state, can have any such effect: and it is equally certain that they cannot possibly be introduced by the mouth, without suffering such a dilution as must entirely destroy their coagulating powers.

They have, I believe, been hardly thought of as inspissants: and the purpose of inspissation has been commonly proposed to be executed by introducing substances of a thicker consistence

than usual ; and which, if they could remain in the body in that condition, might perhaps answer the purpose : but we are clearly of opinion, that all of them, before they can be introduced into the blood-vessels, must be reduced to the same state of fluidity that our fluids ordinarily have : and therefore that the purpose of inspissating cannot by these be obtained.

CHAPTER XII.

DE MULCENTIA.

THESE are medicines suited to obviate and prevent the action of acrid or stimulant matters ; and that, not by correcting or changing their acrimony, but merely by involving it in a mild and viscid matter, which prevents it from acting upon the sensible parts of our bodies. We have mentioned before the use of oil for this purpose, in covering both acids and alkalines : and even the vitriolic acid may be in a great measure covered by being mixed with a mucilage of gum Arabic.

These effects of demulcents are sufficiently evident with respect to the external parts : and it may be presumed that the same may happen with respect to the internal, so far and so long as the acrid continues mixed with the demulcent. But here the difficulty occurs, to suppose that the demulcent matter retains its mild and inviscating quality, after it has been taken into the body. To cover acrimony, it is necessary that the demulcent should be of a considerable degree of viscosity : and when it is such as can be diluted with water, a considerable dilution greatly diminishes its power, and renders it almost none at all. But the most part of demulcents cannot be long in the stomach, or in passing through the intestines and other passages into the blood-vessels, without suffering a dilution that must take off their viscosity altogether.

And it is further probable, that demulcents being commonly of a nutritious kind, must, by the power of the gastric liquor, and perhaps by a fermentation they undergo in the stomach, be rendered of the same fluidity with the other aqueous fluids of the body. All this reasoning I can employ with respect to the demulcents, such as the mucilages and sweets which are of an aqueous nature, to afford this conclusion, that such demulcents can have no effect as such in the mass of blood, or in passing by the various excretions.

With respect to the oily demulcents, the matter is not so obvious. But considering what we have said above of the diffusion, and even mixture of oil in our fluids, it will be probable that no quantity of it can be commonly present in the mass of blood, so as to act as a demulcent, or in their oily state to pass off by the excretions.

We have indeed alleged above, that oil is a matter fitted to inviscate the vegetable acid taken into the body : but by that very

mixture the form of the oil is changed, and it loses its fitness to be an inviscated matter. There is, indeed, another argument that might be employed in favour of the inviscating, and, if you will, demulcent, nature of oil. It has been observed, and we have pointed it out above, that when an acrimony, in consequence of certain diseases, prevails in the mass of blood, an absorption of the oil which has been formerly laid up in the adipose membrane takes place: and it is with great probability supposed, that in this nature intends that the absorbed oil should cover the prevailing acrimony: and this supposition presumes that the oil is fitted for that purpose. All this is probable: but that it will apply to show that the oil taken in by the mouth will act as a demulcent, is to me very doubtful. In the other case of absorption, there may be circumstances, both in the nature of the acrimony prevailing, and in the state of the oil absorbed, which we do not know with any exactness.

To conclude the subject of the demulcent power of oil, I must observe, that the oil commonly present in the blood, or even copiously introduced, is not a demulcent with respect to some acrimonies taken into the body. The vitriolic acid passes copiously by the skin in its acid state when it cures the itch: and the muriatic acid is found ready to irritate issues and open ulcers. And we might give other instances of acrid matters passing by various secretions in their acrid state, notwithstanding that a great deal of oil is at the same time taken in.

From these considerations it seems probable, that the operation of demulcents in covering acrimony in the mass of blood must be very inconsiderable; and therefore, that they do not allay coughing by covering that acrimony, which, exhaling from the lungs, and applied to the glottis, excites that uneasy motion. But it is certain, that the taking in of demulcents often allays coughing, and suspends the repetition of it for some time; and this, without having recourse to their operation in the mass of blood, may be accounted for in another way. As coughing is ordinarily excited by a halitus or vapour of some acrimony, arising from the lungs, and irritating the very sensible parts of the glottis and its neighbourhood; so by besmearing these parts with a demulcent matter, we may often avoid the irritation we speak of, and therefore the frequency of coughing. Accordingly, medicines perfectly mild and free from acrimony, but of considerable viscosity, being swallowed leisurely, so that they may adhere to the fauces, answer these purposes.

After these general considerations, I shall offer a few remarks upon the particulars that have been employed; leaving it to the practitioner to employ them or not, as he shall judge proper.

ASPERIFOLIAE.

SYMPHITUM.

Some other of the *asperifoliae* contain a portion of mucilagi-

nous matter: but it is not in common to the whole of the order; and I have set down two only that have been chiefly in use.

The root of the symphitum gives out a large proportion of a mild mucilaginous juice, and perhaps in larger proportion than almost any other root; and therefore, while mucilaginous matters are retained in our lists, I do not perceive why both the British colleges have entirely omitted the symphitum. It may be of service, as alleged, in diarrhæas and dysenteries: but that it has ever been of use in hæmoptysis, for the reasons given above, I cannot admit.

CYNOGLOSSUM.

The root of this affords so little mucilage, that it is not to be taken notice of on this account. But it has been formerly considered as having somewhat of a narcotic quality, and its sensible qualities might lead to a belief of it. But trials made on purpose to examine this have not at all confirmed it.

MUCILAGINOSA.

These are the medicines especially trusted to in practice as demulcents; and I have set down the chief of them, which are the most pure and simple mucilages that nature affords.

GUMMI ARABICUM.

To this I have subjoined the *gummi cerasi*, to show, that where it can be had in tolerable purity, it may be employed for every purpose of the foreign gum Arabic.

The gum Arabic is the mucilage most universally employed; because it can be introduced in the most concentrated state, and therefore easily in the largest quantity: and its demulcent qualities are supposed to be very considerable. They are supposed to reach the bronchiæ, and thereby to correct the acrimony that occasions coughing, and especially supposed to reach the urinary passages, and there to cover any acrimony prevailing in the urine. This is a doctrine so universally prevailing among physicians, and so generally followed in practice, that I had great difficulty in trusting my own judgment in admitting any doubts concerning it. But after much reflection, the reasons employed still prevail with me, and persuade me, that even gum Arabic, as an internal demulcent, can be of no service beyond the alimentary canal. Besides the general reasoning above with respect to this gum, the one taken from the quantity thrown in is of much weight with me. In common practice, hardly more than a few ounces are given in one day; and what that can give of a mucilaginous quality to many pounds of serosity, I leave my intelligent readers to judge. Still, however, it may not be thought enough to reason *a priori*: and I should say what experience has actually taught. What others may have observed, I cannot determine: but for myself, I can assert, that in innumerable trials, I have never observed the effects of gum Arabic in the mass of blood, or in the excretions derived from it. The most frequent occasion for its use is in the ardor urinæ; and in that I have

been often disappointed ; and have often found, that two pounds of water, or watery liquors, added to the drink, would be of more service than four ounces of gum Arabic taken in without such addition.

TRAGACANTHA.

After what I have now said on the subject of gum Arabic, I need not say that the tragacanth, though more powerful as a mucilage, cannot be of any greater use as a demulcent.

After these gums I have set down the Amylum, as, with a little water, it forms a considerable portion of mucilage: and in this state it may be of use in the great guts in the case of dysentery. But its demulcent powers cannot be considerable: and even in the cases of dysentery might be better obtained, and with less trouble, from other substances.

ICTHYOCOLLA.

After the vegetable, I have here subjoined the animal mucilages, the most powerful of which is the ichthyocolla. This may afford an useful medicine in the alimentary canal: but that it goes farther, I cannot admit of: and all the arguments I have employed above against the power of demulcents, will, in my opinion, apply equally here.

With respect to this article, and to the one that follows, the *gelatinæ ex rebus animalibus*, I would add, that there is another argument against their retaining their mucilaginous quality in the blood-vessels and excretions; which is, that as animal substances, from the nature of the animal æconomy, they must be constantly approaching to a putrescent state, and in proportion to this, have their mucilaginous quality destroyed.

OLEOSA BLANDA.

How far these can in any case prove demulcents, I cannot positively determine: but, in my introduction to this chapter, I have considered the matter as fully as I can, and need not repeat any thing here.

CHAPTER XIII.

ANTACIDA.

THAT there is almost perpetually in the human stomach a quantity of acid of the nature of the vegetable acid from which it is derived, cannot, in my opinion, be doubted; and that it is very often copiously present here, every body knows. From these appearances, it might be suspected that a quantity of the same acid might pass unchanged into the mass of blood, and be often present there. Dr. Boerhaave, in writing his Aphorisms, seems to have been of this opinion; and mentions the supposed effects of an acid prevailing in the mass of blood. But afterwards, on reflecting on the general tendency of the human æconomy to a putrescent state, he seems, in his chemistry, to have

deserted his former opinion: and the supposition of an acid in the mass of blood has been deserted by his followers, and indeed by every physician since. The medicines, therefore, comprehended under the title of this chapter, have been considered as adapted only to the correction of acidity in the alimentary canal. Some years ago I should have been of this opinion: but some late discoveries have given me better instruction. By the analysis of the urinary calculus by Scheele and Bergman, we are taught that this concretion is formed by an acid: and Boerhaave's experiments show, that a matter fit to form such a concretion is constantly present in the most healthy urine, and ready to form such a concretion, whenever a matter fit to favour its accretion is presented to it. All this shows, that the acid often copiously taken in is not entirely destroyed in the course of the circulation, but subsists, and is carried to the remotest passages. All this may make some changes in our physiology of the fluids: but I am not ready to prosecute this here; and can only at present make some application to the pathology of the urinary calculus: and even this I cannot carry very far. I cannot say what are the means of determining the different quantities of calculous matter at different times present in the urine; what are the various circumstances that determine its concretions; and particularly, what are the causes of the uneasiness and pains that arise from calculi formed. I find all this to be extremely difficult: and I shall not attempt to solve these, and perhaps some other problems that might arise.

I must be satisfied now with what seems to be enough for my purpose; which is, to observe, what experience has shown, that antacid and alkaline substances are what have given the most certain relief in the most part of calculous cases.

This has been long ago known. And physicians have very often gone into the opinion, that the relief obtained in such cases was by the medicines dissolving the concretions that had been formed in the kidneys or bladder: and it is not yet absolutely determined whether they ever do or not. I am indeed of opinion that they do not. But it is by no means necessary to determine the question; as we allow it to be proper to employ them wherever they conveniently can be. In the mean time, it is enough for me to remark, that it is now sufficiently certain, that alkalines do not always dissolve the stones in the urinary passages: but, in many cases, without dissolving the calculi, they certainly relieve the pain and uneasiness which the presence of the calculus occasions: and therefore, upon every supposition, their employment is proper: and I proceed to what may be said of the administration of

PARTICULAR ANTACIDS.

I have set down a pretty long list: but it is not necessary to take much notice of each of the particulars.

LAPIDES CALCARIÆ.

The Creta, and the several testacea, are much of the same nature ; and are especially fitted for correcting the acidities of the primæ viæ, and for that purpose may be used in large quantities : and some have imagined, that by being joined with the acid of the stomach, they may become astringent : but I have not observed this ; and if it does ever happen, I believe it is a rare occurrence. They sometimes seem to be of service in diarrhœa : but this I impute not to their astringent quality, but merely to their correcting acidity, which, by being mixed with the bile, had occasioned the disease.

The corallium and corallina are alkaline and absorbent ; but the present practice neglects them as unnecessary.

The cornu cervi ustum is still retained in the list of the London Dispensatory. But as it is the weakest of all the absorbents, and has not, so far as I know, any peculiar virtues, I think it might have been omitted as it is by the Edinburgh college.

MAGNESIA.

This may be employed as an absorbent ; as it does not differ in its chemical qualities from the others mentioned : but in its medical, it differs from all others ; as, when joined with a vegetable acid, and such as it commonly meets with in the human stomach, it proves a laxative, operating much in the same manner, though not so strongly, as the magnesia glauber salt.

The antacids hitherto mentioned are chiefly employed for correcting the acidities of the stomach ; and have not been commonly employed in the cases of calculi, as mentioned above ; though, upon our theory, they might be, and sometimes have been, with advantage. It would appear that they cannot be conveniently employed in such quantity, as to absorb so much acid as seems necessary to give so entire relief in calculous cases as is to be wished. It has therefore been found necessary to have recourse to the alkaline salts ; and such I consider the impregnation of *lime-water* to be. This we have known in several instances, when taken in large quantity, to be sufficient for the purpose : and with respect to it, I have only to remark, that from many trials, the lime-water made from common lime-stone is equally effectual, and generally more agreeable, than that made from a lime prepared from any of the testacea.

As there may be imperfections in preparing lime-water, and as it is frequently inconvenient to give it in sufficient quantity, so practitioners have of late years depended upon the use of the proper alkaline salts ; and as I am persuaded that these, from several considerations, are most effectual in their caustic state, so I have frequently observed the good effects of it in that state, as it has been commonly exhibited in what has been called *Chittick's* medicine. This, however, has frequently failed : and I impute its failure either to its not being properly administered, or to its not being given in sufficient quantity.

In order to relieve the uneasiness arising from calculi, I know from much experience, that it is necessary that the alkaline remedy should be exhibited in considerable quantity, and very constantly. But for this purpose, on account of its acrimony, it is not easy to exhibit the pure alkali, unless some measure is contrived for covering it in the mouth and fauces. Such a measure might be supposed to be the employing soap: and I have accordingly found it, in some cases, employed with great advantage. But there are several inconveniencies that prevent the employment of it in large quantity: and though there might be means of obviating these, I do not inquire after them; as we have found another means of answering our purpose that is commonly very effectual. This is done by saturating a pure fixed alkali with the aerial acid. This covers the acrimony, and any thing disagreeable in the alkali; which therefore can be taken down into the stomach in large quantity: and as this acid is readily separated by the acids so constantly present in the stomach, it allows it to have all the effect in correcting the acidities of the stomach, that can be wished for; and has now been found by frequent experience to relieve all the uneasiness arising from calculi, more certainly and more completely than any other remedy formerly tried. The apparatus and measures necessary in making this preparation, are now so commonly known, that I do not think it necessary to insert them here.

CHAPTER XIV.

ANTALKALINA.

HAD it not been to give some appearance of system, and from my complaisance to Dr. Boerhaave, who treats de Morbis ex Alkali spontaneo, I should not have admitted of this chapter; for I am well persuaded, that no alkaline salt, in its separate state, ever exists in the blood-vessels of the living human body. The doctrine of Boerhaave, which I have just mentioned, is, in almost every part of it, incorrect and erroneous; and leads to no occasion for the use of antalkalines. And the only occurrence that can require them is a very rare one, that of a pure alkali being thrown in by mistake or accident into the stomach; and the means of taking off its irritation by acids is sufficiently obvious; only this farther is to be remarked, that as the alkali, in any noxious quantity, cannot have been introduced without hurting the mouth, fauces, and œsophagus; so it is always necessary, in such cases, along with the acids, to employ the large use of diluents and demulcents.

CHAPTER XV.

ANTISEPTICA.

THAT there is, in the animal œconomy, a constant tendency to putrescency and putrefaction, is now admitted by every physician. The complete putrefaction cannot, in any considerable portion of the body, take place without extinguishing life: and therefore a competent putrefaction is not a disease of a living body that can be an object of practice. It is the tendency to it which, in any considerable degree, produces various morbid disorders, and requires the utmost skill of our art to prevent. By what steps this tendency proceeds, and in what different degrees it may appear, we do not clearly understand: and therefore, to this tendency, in all its several degrees, I have given the general name of putrescency: and the medicines suited to moderate and correct this, I name Antiseptics; and have endeavoured to enumerate them in this chapter.

The list is taken from experiments made out of the body: and even there they show their power to be in various degree, and manifestly to be more or less suited to application in the living body. But before proceeding to consider that, I must observe, that the state of putrescency in the living body seems to be in different conditions, and requiring therefore different remedies. The one I call the Acute, the other the Chronic Putrescency. The first attends febrile disorders of various kinds; and, if I mistake not, appears, upon occasion, in fevers of every kind. The chemical condition of the fluids in this putrescency, I do not pretend to determine with any clearness. But, in my First Lines, on the subject of the Prognostic in Fevers, I have endeavoured to mark the various symptoms by which what I judge the putrescent state of the fluids may be ascertained, and to remedy which our antiseptic remedies are to be applied.

The other species of putrescency, which I have called the Chronic, is, as I judge, what appears in scurvy. And altho' the nature and chemical state of the fluids in this disease are not well ascertained, yet I think it enough that, as the symptoms of the disease are well known, and for the most part characteristically determined, I may speak of it as an object of the application of antiseptic remedies, which are often employed in the cure of it with advantage. Of these, in particular, as enumerated in my catalogue, I would now proceed to speak; but must first make a remark that must in some measure correct the general system.

I have said that one state of putrescency is that which especially accompanies febrile disorders: but I believe that the same state may occur without having any fever joined with it. We have seen several instances in which numerous petechiæ have appeared on the surface of the body, without any fever appearing at the same time. But as with these petechiæ there occurs a fetid breath

and spongy bleeding gums, these, with the petechiæ, have been considered as marks of a putrescent state of the fluids.

I have known one instance which seems applicable to our present consideration: This was a woman who lived very constantly upon vegetable aliment, and had not been exposed, so far as could be judged, to any febrile or putrid contagion, and who was, without feeling any other disorder, affected with numerous petechiæ over the whole surface of her body. After these had continued for some days, without any symptoms of fever, she was affected with swelled and bleeding gums, with fetid breath and much thirst; and in the course of a week or two more, almost every symptom of a putrid fever came on, and in a few days proved fatal.

Such cases, with the petechial case above mentioned, seem to show that the human fluids, without fever, and without the causes of scurvy having been applied, may run in a putrescent state: and whether this case may be considered as a peculiar state of putrescency, I dare not determine; but am much disposed to think it not much different from the others; and that, indeed, tho' different by its causes, it is much the same with the febrile putrescency.

Having thus ascertained these different states as well as I can, I proceed to give some remarks on

PARTICULAR ANTISEPTICS.

SALES ACIDI.

These are universally antiseptic, and may be employed in all cases of putrescency. The fossil acids have not been employed in scurvy with any advantage: and the reason is obvious, as that disease requires a change in the animal fluid, which we have shown above does not admit of an union with those fossil acids. It is therefore, that in this disease the vegetable acids, as capable of such union, are more universally proper, and are accordingly employed with certain success.—In the febrile putrescency, a fossil acid, particularly the vitriolic, has been very generally employed; and whether from its concentrated state it has any advantage, I cannot determine. But as it does not unite with the animal fluid, and is even limited in the quantity in which it can be exhibited, I am persuaded that the vegetable acid, both by the union it can form with the animal fluid, and by the large quantity in which it may be given, will be the most effectual.

Whether as antiseptics there is any difference between the native acid of vegetables, and the fermented acid in vinegar, may be a question. I am disposed to think, that in cases of febrile putrescency, the latter may be generally useful, and perhaps more fit than the former. But in cases of scorbutic putrescency, I am pretty certain that the native acid, for reasons already given, will be always the most useful: but the former, as approaching more to an alimentary matter, must be fitter in the case of scurvy.

SALES ALKALINI. TUM FIXI TUM VOLATILES.

Experiments out of the body show that these alkalines are truly antiseptic powers. But at the same time it is equally well known that they are constantly imbued with such an acrimony, that they cannot by themselves be introduced into the body without acting more by their stimulant than by their antiseptic powers. The volatile alkali may sometimes be an useful remedy in putrid fevers: but it cannot, as some have imagined, be given more freely on account of its antiseptic powers; as it can never be given largely enough to have any effect by these qualities.

SALES NEUTRI VEL TERRESTRES.

These saline matters, by experiments out of the body, are manifestly antiseptic; but how far applicable in cases of morbid putrescency, we are very doubtful. As, in my opinion, scurvy consists in a preternaturally saline state of the blood, so I would judge that every addition of saline matter must be in some measure hurtful, and therefore that they are not anywise admissible in this disease.

In the case of febrile putrescency, no such objection lies against their use: and they are commonly employed in fevers, both for their refrigerant and antiseptic powers. The former purpose is often obtained by their operation on the stomach: but that their refrigerant power renders them antiseptic, is very doubtful. But however that may be, I am persuaded that in any quantity in which they can be taken into the body, their antiseptic powers in the blood-vessels can never be considerable. An ounce of nitre, exhibited in divided doses in the course of twenty-four hours, can have very little effect on a fermentation going on in the whole mass of blood, or in the serosity, consisting at least of fifteen pounds of fluid.

PLANTARUM PARTES ACIDAE.

This need not have been inserted after the general title of *Acida*: but it was not amiss to point out, that the native acid of vegetables is the antiseptic that can be employed in the largest quantity; and for a reason given above is, I believe, adapted to every species of scurvy.

OLERA ACESCENTIA.

As these can be introduced largely as an aliment, they are found to be the most powerful and effectual antiseptics that can be employed in scurvy.

As I am persuaded, that the most certain means of obviating scurvy is by filling the blood vessels with *acescent* matter; so I long ago gave my opinion, that Sugar and Honey, much employed in diet, might be a means of preventing the disease: and my opinion on this subject gave the first hint to Dr. Macbride for his proposing the employment of malt. I am not indeed certain that sugar, in its purely saline state, will so readily enter into the composition of the animal fluid as a farinaceous matter,

which besides sugar, contains a quantity of other alimentary substance: but I still maintain, that the infusion of malt, which has been found to be so salutary, has its virtues chiefly depending upon the sugar it contains.

PLANTAE SILIQUOSAE ET ALLIACEAE.

Why I put these together will be obvious from what is said of them above. Both these orders of plants, by experiments out of the body, shew an antiseptic power; and may be supposed to have more or less of the same when taken into the blood; and even upon that footing have their use in scurvy: but their antiseptic powers are not considerable. And I am of opinion, that in any quantities in which they can be taken in, except it be in such quantity as can be employed as alimentary, and be at the same time directed to an acescent fermentation, they cannot be considered as powerful antiseptics: and I hold the most acrid substances of the orders mentioned to be especially useful in scurvy, by their promoting the excretions of putrescent matter by perspiration and urine.

ASTRINGENTIA.

In experiments out of the body, these are found to be powerful antiseptics. But I do not find that they can be taken into the body in such quantity as to be internally of much service. They have been frequently employed in the case of scurvy: but their effects have never appeared to be considerable: and I am of opinion that they should not occupy the place of more powerful remedies.

AMARA.

I have to say much the same thing of these as I have said of the astringentia: and they have never been found very useful in obviating or preventing scurvy. In cases, however, of a febrile putrescency, commonly attended with a considerable debility, they may possibly, by their tonic powers, have their use.

I am led to this in considering the Peruvian bark, which I comprehend under the title of Amara. This bark is well known to practitioners to be highly useful in all cases of febrile putrescency, when it is employed in sufficient quantity.—Whether, however, its effects are to be ascribed to its tonic or to peculiar antiseptic powers, I cannot certainly determine: but I am disposed to think that the former opinion is the best founded; which, however, need not prevent practitioners, either in the case of fever or scurvy, from employing its antiseptic power as far as they may think proper.

The benefit received from it in scurvy has never been remarkable: and I should say the same thing of it that I said above of astringents, that it should never occupy the place of more effectual remedies.

Whether, in cases of fever, any other tonic medicine might be employed in place of the bark, does not seem yet to be determined by proper experiments: but it certainly deserves to be considered, when, upon occasion, the bark may be wanting.

AROMATICS,

And their essential oils, are set down here, as being certainly, in experiments out of the body, antiseptic. But I am of opinion that they cannot, upon account of their stimulant and heating power, be admitted as medicines in any cases of putrescency, except that in certain cases of gangrene they may be externally employed.

CAMPHORA.

The various and singular power of this we have taken notice of above: but there are none of its powers more remarkable than its antiseptic: and though for its use in this way it can hardly be given in large quantity, I am clearly of opinion, that in all cases of putrid fever, where it can be on any account admitted, it ought always, with a view to its antiseptic power, be employed as largely as possible. In cases of external putrescency its use has often been most beneficial.

GUMMI RESINAE.

I have set down these in the list of antiseptics, as they prove manifestly such in experiments out of the body. But there is the same objection to their internal use as I made with respect to the aromatics. Their stimulant cannot be compensated by their antiseptic powers.

Their external use I leave to be judged of by the surgeons: but I believe it has been more frequently employed than it ought to have been.

The other articles of the catalogue of antiseptics, that is, Crocus, Contrayerva, Valerian, and Opium, are all set down here upon the same footing as the last article of Gummi Resinæ; and that is, from their being found in experiments, out of the body, to be in some measure antiseptic; but none of them are so considerably or powerfully such as to promise being of much use in cases of morbid putrescency.

VINUM ET LIQUORES FERMANTATI.

After what I have said above of the use of acids and acescents, I need hardly have inserted this article; but it cannot be amiss to repeat, that the plentiful use of weak fermented liquors of all kinds is a most certain mean both of obviating and curing scurvy.

I have here set down *Alcohol*, as certainly one of the most powerful antiseptics known: but as we cannot easily divest it of its stimulant power, it is very doubtful if it ever can be employed as an antiseptic in cases of morbid putrescency.

There are, however, cases of putrescency attended with very great debility: and whether in such cases the alcohol properly diluted can be employed in place of wine and bark, may be doubtful; but in cases where either of these is wanting, or cannot be easily obtained, I am persuaded that the diluted alcohol may be usefully employed.

EVACUANTIA.

Having now considered the several medicines which are sup-

posed to change the state and condition of the fluids, I proceed to consider those which excite and promote the evacuation of them.

In this I do not find it necessary to consider evacuations in general, and therefore those made by blood-letting, blistering, or other such; and am only to consider those evacuations which are produced by exciting and promoting those which nature has instituted.

With respect to these I might observe, that the evacuation may be produced in two ways; that is, either by medicines which change the state of the fluids so as to fit and dispose them to pass off more copiously by certain secretions, or by medicines which, internally or externally, are applied to excretories, from which we propose to excite a more copious excretion. These different measures, however, we do not propose to consider here; as we think it will be more properly done when we are to consider the several particular evacuations to be treated of. We proceed then to consider the particular evacuations and evacuants, arranging them as they occur *a capite ad calcem*; that is, considering first those made from the superior parts, and afterwards those from the inferior. This arrangement has no particular advantages: but no better offers itself at present.

I begin therefore with the Errhines.

CHAPTER XVI.

ERRHINA.

THESE are medicines which procure a discharge from the nose, sometimes of a mucuous, and sometimes of a thinner fluid; but which in both cases we suppose to proceed from the mucuous follicles of the Schneiderian membrane upon the internal surface of the nose, and of the cavities adjoining to it.

This evacuation is sometimes procured without any sneezing, but frequently attended with it. This however implies no difference but merely that of stronger or weaker stimulus in the medicine employed. The sneezing that occurs may have particular effects by the concussion it occasions: but it does not vary the evacuation induced by the medicine, excepting that with sneezing there is commonly a larger evacuation produced.

This evacuation often goes no further than to restore the natural evacuation when it had been interrupted: but it commonly goes further, and increases the evacuation beyond its usual measure; and that not only for some time after the medicine has been applied, but also for some following days.

This evacuation not only empties, but also produces a larger excretion from the mucuous follicles of the Schneiderian membrane: but, agreeable to the laws of the circulation, this must produce an afflux of fluids from the neighbouring vessels, and in

some measure empty these. By this it often relieves rheumatic congestions in the neighbouring muscles, and particularly those in which the tooth-ach often consists.

But not only the more nearly adjoining muscles are thus relieved; but the effects may extend further to the whole of the branches of the external carotid: and we have known instances of head-achs, pains of the ear, and ophthalmias, cured or relieved by the use of errhines. How far their effects may extend, cannot be exactly determined. But it is probable that they may operate more or less on the whole vessels of the head, as even a branch of the internal carotid passes into the nose: and independent of this, it is not improbable that our errhines may have been of use in preventing apoplexy and palsy: which at least is to be attended to so far, that whenever any approach to these diseases is suspected, the drying up of the mucuous discharge should be attended to, and, if possible, restored.

These are the effects of an increased discharge from the nose; and we are to say next how they are to be obtained, which is to be done by stimulants applied to the internal surface of the nose; and I have set down a list of such as may be employed. These differ only by the degree of acrimony they possess: and I have endeavoured to arrange them accordingly: but I could not possibly do this with much accuracy.

BETA.

This is of no great power: but I have set it down, as from the time of Galen to the present it has been marked by many writers as an useful errhine: but in my trials, the juice snuffed up the nose gave no large or durable evacuation.

BETONICA. MARJORANA.

These by themselves have not much power as errhines: and I believe the power they have is in common to them with many others of the verticillated plants: and they seem to be only useful, by diffusing and giving an agreeable odour to the other errhines.

ASARUM.

This is to be considered hereafter as an emetic and purgative, and here only as an errhine, in the list of which it has been long reckoned: and I truly find it to be one of the most useful and convenient. In large doses it is very powerful and sometimes too violent. But in more moderate doses, not exceeding a few grains, and repeated for several evenings together, it may be employed to procure a pretty large watery discharge from the nose: and which sometimes continues for several days together. By this it has the general effects of errhines above mentioned, and particularly has proved very useful in tooth-ach and ophthalmias.

It is properly the basis of the pulvis sternutatorius of our colleges. But I judge the London college have added too large a proportion of the cephalic plants, which renders the dose of the chief ingredient, the asarum, by much more bulky than conve-

nient; and that the Edinburgh college have given a composition much more convenient for a proper exhibition. I find that three grains of asarum is a proper dose; and that four grains of the whole powder makes a convenient snuff.

NICOTIANA.

This, as commonly prepared for persons who amuse themselves by snuffing, I find may, with people unaccustomed with it, be conveniently enough employed as an errhine. It will be of different force with different persons: but in a moderate dose it is never violent with any. Repeated once a-day it may, like the asarum, continue a discharge for some time: but repetition is ready to diminish its power, and render it useless. I observed above, that even in people accustomed to snuffing, it has different effects in producing more or less of a discharge from the nose: and from my own experience, I am led to repeat here, that whenever the discharge has been considerable, the laying aside snuffing, and therefore suspending that discharge, may have very bad effects.

EUPHORBIIUM.

Here I enter upon the mention of the more acrid errhines: and I believe the euphorbium is one that is the most so: but before mentioning the precautions necessary in the use of it, and several others that might be added, I must observe that the more acrid errhines, even in moderate doses, are ready to inflame the internal surface of the nose, and often to a considerable degree: and this is often communicated not only to the immediately adjoining parts, but to the whole branches of the external carotid, so that the whole of the teguments of the head are affected with considerable swelling. These effects, by being at the same time attended with hæmorrhagy from the nose, and violent sneezings, may have very mischievous effects: and it is very seldom that they ever answer any purpose of medicine. It is therefore my opinion, that they should never be employed in doses that may have the consequences mentioned. Whether they are ever to be employed in lesser doses I am doubtful. I have seen some instances of megrims, ophthalmias, and particularly tooth-achs, cured by the violent operation of errhines: but I never thought it safe to imitate the practice.

It is possible, that employed in very moderate doses, they may increase the power, and render more permanent the effects of the asarum or of tobacco; and I have sometimes thought that they answered this purpose: but it is the white hellebore only that I have employed to the quantity of one grain to half a drachm of the sneezing powder. I have sometimes tried the euphorbium: but it is liable to be violent even in very small quantities.

There is one sternutatory sometimes employed by the vulgar of this country: and that is the succus radicis iridis nostratis. But as the juice is snuffed up the nose, the dose of it cannot be well measured; and I have frequently found the effects of it very violent.

CHAPTER XVII.

SIALAGOGA.

FOR the sake of comprehending the last article, I have thought it necessary to employ the general title, while, with respect to the others, I could not distinguish them as acting more upon the mucuous follicles than upon the salivary glands. It answers our purpose very well to distinguish the sialagoga as applied externally to the excretories from which the evacuation is to be produced, or as they are applied internally, and operating, as supposed, on the state of the fluids to be poured out.

The medicines externally applied, are, for obvious reasons, named Masticatories. They have frequently, and properly enough, been called, Apophlegmatizonta: but I did not employ the term, because it comprehends, without distinction, both the errhines and external sialagogues.

The latter, which I am to speak of now, are certain acrid substances, which, applied to the internal surface of the mouth, stimulate the excretories of saliva and mucus opening there; or as nature has ordered, that upon any acrid matter being applied to the sensible parts of the tongue, or internal surface of the mouth, a quantity of saliva and mucus should be poured out to wash it off, or to obviate its effects; so by this, as well as by an application to the excretories, an evacuation is produced, and commonly a much larger than can be produced by any application of errhines.

This evacuation, however, operates in a manner very analogous to that of the errhines. By their emptying the salivary glands and mucous follicles, they produce an afflux of fluids from all the neighbouring vessels, and which is upon occasion extended, as we alleged the evacuation of errhines to be, to the whole branches of the external carotid. By this it will be readily understood that our masticatories may relieve rheumatic congestions, not only in the neighbouring parts, as in the case of tooth-ach, but also congestions or inflammatory disposition in any part of the system of the external carotid.

The means that may be employed for the purpose are many; and indeed every one that can prove acrid or heating to the tongue or internal surface of the mouth. I have set down a list marking the angelica as mild and agreeable; the imperatoria, as one more acrid; or, as more acrid still, the pyrethrum, which therefore is commonly employed. I need not prosecute the pointing out and considering others; and have only to mention, that I have found none more effectual, though not marked in my list, than a bit of fresh horse-radish root held in the mouth, and chewed a little there.

These are the external sialagogues: and I must next treat of the internal, of which the only example is the celebrated

HYDRARGYRUS.

This I shall often speak of under the appellations of Quicksilver and Mercury. But these terms are now so commonly employed and understood, that I am in no danger of being mistaken. I shall treat of this medicine as fully as I can, as it is one of the most useful and universal medicines known: and it has indeed, on that account, been the subject of much discussion and writing: but as I judge much of this to be superfluous, I am to endeavour to bring the matter into the most concise and simple view possible.

Quicksilver, in its native, and as we commonly speak, its running state, is, I am persuaded, a perfectly inert substance, with respect to the human body. About sixty years ago, upon the authority of Dr. Dover, the author of the *Ancient Physician's Legacy*, crude quicksilver was brought into frequent, and even fashionable use: and I knew many instances in which it was employed very largely, and for a long time: but upon the most fair and strict examination that I could make, it never had any sensible effects, or cured any one disease.

Since that time it has hardly ever been employed in practice, except upon the supposition that by its weight it may overcome some strictures or obstructions in the intestinal canal. But the theory of this has been mistaken: and I have never known, in several instances of its employment, nor have I heard, of any instances of its success in practice.

To render quicksilver therefore active with respect to the human body, some changes in its chemical state, or some additions to its substance, are found to be necessary. What are the various means of rendering it thus active, I shall endeavour to ascertain hereafter. But as I am disposed to judge that the effects of it, in all its active states, however various, are always very much or nearly the same, I shall begin first with considering these.

Universally mercury in its active state seems to be a stimulus to every sensible and moving fibre of the body to which it is immediately applied; and in consequence, it is particularly a stimulus to every excretory of the system to which it is externally or internally applied. Besides its noted effects upon the excretories of the saliva, it seems to operate upon the whole of those of the alimentary canal. It proves often diuretic: and I have particular proofs of its reaching and acting upon the organs of perspiration.

Although it may sometimes operate more upon certain excretories than upon others, it may be presumed, that when any tolerable quantity is thrown into the body, it is in part distributed over the whole: and therefore its medicinal effect is, that it is the most universal aperient and deobstruent known: and to how many cases of disease this operation may be applicable, will be sufficiently obvious.

But before going further, I would allege, that the effects we mention of its producing evacuations depend entirely upon the

stimulus given to the excretories, and not at all to any change produced in the state of the fluids. This indeed is not the common opinion: but I am disposed to maintain my own; as upon many occasions of mercury thrown into the body very largely, I have found no difference in the appearance of the state of the blood drawn out of the veins. From the stimulus given by mercury to the whole system, I have always found the blood putting on the same appearance that it does in inflammatory diseases: and particularly, I have not observed any circumstance that implies any diminution of its ordinary consistence.

It has been the common opinion, that mercury diminishes the consistence of the blood, and very much increases its fluidity: but no evidence or proof of this as a fact, that I know of, has been produced: and I believe it has been taken up upon mistaken facts, and supported by a theory which seems to me to be without foundation. This theory, however, has been so common and so universal, that I judge it necessary for me to show it to be false: and I do it upon the following considerations.

Besides the general objections that I have made above, to the doctrine of the *attenuantia* and *incidentia*, the particular application of mercury to the purpose seems to be very ill founded. It has been supposed, that the specific gravity of the particles of mercury might give it more than usual force in dividing the coherent portions of our fluids: but if it be attended to, that as the particles of all bodies, by being divided, have their surfaces so much enlarged, in proportion to their quantity of matter, that the resistance to their passage through other fluids is so much increased, that the heaviest of bodies, gold, can be so divided as to be suspended in water; and though we cannot precisely determine how much the particles of mercury may be divided in its different preparations, yet it may be confidently presumed, that in all of them they are so much divided as to take off entirely the effect of their gravity.

I know that a grain of corrosive sublimate may be divided in eight ounces of water, so that a portion of it may be rendered sensible in every drop of that water. There is therefore no probability of mercury acting upon the fluids by its specific gravity. Whether, however, by its chemical qualities, it may not have effects on the state of our fluids, I cannot be so positive in maintaining; and must candidly own, that its effects in the scurvy seem to point out some effects of it upon the mass of blood. But however it may be in this special case, I am persuaded still from what we have said above, and from many circumstances we shall hereafter mention, I conclude that the chief effects of mercurial medicines are to be ascribed to their general stimulus of the system, and especially to their stimulating the various excretories of it.

I have observed that mercury may, by the circumstances of the constitution, or perhaps by the nature of the preparation em-

ployed, be determined to pass off rather by one excretory than another: but in this there is nothing more remarkable than its very constant tendency to pass off by the salivary excretion. It discovers this so readily, that unless diverted by art to another excretion, a very small quantity of it will always take this course.

This determination gives a problem which has always been considered as a principal one in the consideration of mercury: and the solution of it has been variously attempted. The specific gravity has been again here employed: and upon the supposition of its retaining the direct line in which it is impelled, it is supposed that it will thereby be more certainly determined to the vessels of the head: but as we do not admit of the effect of the specific gravity, so we say, that though it were admitted, the application of it here is not founded on a correct anatomy, and that the whole of the reasoning on this subject is manifestly frivolous.

I believe that from every consideration, the mechanical operation of mercury will be readily deserted: and we must seek for the solution of our problem from chemical considerations, which, however, I find to be attended with much difficulty.

The supposition of its dissolving the blood in such a manner as to render it particularly fit and disposed to pass off more copiously by the salivary glands, cannot, after what we have said above against the dissolving power in general, be anywise admitted: and we must still therefore seek for another solution of our problem. I shall here offer a conjecture on the subject: but as a conjecture only I allow it to be received.

I suppose that mercury has a particular disposition to unite with ammoniacal salts; and an ammoniacal salt increasing the solubility of corrosive sublimate is to me strongly in proof of this. In illustration of it, I would observe, that the union of mercury with the ammoniacal salt of the serosity, explains well why mercury is so much disposed, and more universally than any other substance we know of, to pass off by the various excretories of the body. At the same time, if we can allow, what is very probable, that ammoniacal salts pass off by the salivary glands more copiously than by any other excretion, we shall find a reason why mercury, associated with such ammoniacal salt, will readily pass to the salivary glands; and being thus applied to their excretories, will produce the salivation that so readily happens.

I have thus attempted a solution of the problem proposed; but must obviate some objections that seem to arise to my doctrine. The fætor of the breath attending salivation is supposed to show that some putrid dissolution of the fluids has taken place: but however we may account for that fætor, we must still maintain from what we have said above, that there is no such general putrescency taking place. And I must add here, that there are not only no symptoms of putrescency in the other parts of the fluids appearing during the time of the highest salivation; but that

mercury has no tendency to induce any such state, appears to me from hence, that when the body has been long and largely drenched with mercury, as soon as the irritation of this ceases, there is not the smallest symptom of putrescency, or of any tendency to it, appears in the state of the fluids, which on the contrary immediately appear in their most natural and perfect state. The fœtor, therefore, attending salivation, must be referred to some operation upon the saliva itself; upon which I might perhaps offer a conjecture, but do not incline to offer any more of that kind.

However it may be, I think it is probable that the operation of mercury is almost entirely in the mouth: and it is proper to observe, that the business commonly proceeds in this manner. The operation of the mercury is always first perceived by a disagreeable taste in the mouth, which is commonly such as if some preparation of copper had been applied to it. This is always attended with some degree of redness and swelling in the gums and other parts of the mouth. As these symptoms increase, the saliva flows more copiously: and commonly these symptoms of irritation, and the largeness of the salivation, are in proportion to one another; so that there can be no doubt that the flow of saliva depends upon an irritation applied to the excretories of that fluid: and though we should not be able to explain the whole of the phenomena attending it, we have no occasion to seek for any other cause of the excretion produced.

After these remarks upon the operation of mercury, we are led to speak of its effects in curing diseases: and here nothing more remarkable presents itself than its peculiar power in curing the venereal disease. How it is peculiarly adapted to this, it is difficult to explain: and the explanation has been attempted in different ways.

Some ingenious men have thought that mercury is an antidote to the poison which occasions the disease: and though they have not brought any evidence in proof of this, they have shown that other explanations are so unsatisfying that we are in a manner obliged to have recourse to this: and I have lately met with some facts that are very favourable to the supposition. A physician took a quantity of matter from a venereal chancre; and mixing it with a quantity of *Plenck's* gummy solution of mercury, he applied this mixture to a sound person, but could not find that it produced either a chancre or any other syphilitic symptom. This may seem to afford some conclusion; but as I am not acquainted with the circumstances of the experiment, nor have any account of its being repeated with attention, I cannot admit of any conclusion from it; both because it is very possible that the gummy solution might render the mercury inert, without making any change in the nature of it, and because it is still liable to all the objections that can be made to the operation of an antidote.

With respect to this, not to mention the difficulties which occur in explaining the application of the antidote to the poison, I think it necessary only to offer one consideration; which is, that if mercury be an antidote to the venereal poison, the cure of the disease should be always more or less readily finished, according to the quantity of mercury thrown into the body; and considering how universally the poison is diffused, it should seem that a pretty large quantity of mercury should always be necessary. But practitioners will hardly allow that either of these circumstances constantly take place: and we maintain that the most active preparations are most speedy in curing the disease.

Whether corrosive sublimate be always the most proper remedy, may be doubtful. But we maintain, that in many instances it cures the disease by a smaller quantity of mercury than can be done by any other preparation, though the latter introduces the mercury in much larger proportion. This, to me, renders it very probable, and almost certain, that mercury does not cure the disease by being an antidote to the poison, but in some other way, whether we can explain this or not.

The most specious argument in favour of mercury's being an antidote, is its being applied to parts of the body in which the venereal poison is accumulated more largely, and its proving readily a cure of the local disease. This appears especially in the case of chancres, which are readily cured by the immediate application of mercury to them. But this does not afford a conclusion; for mercury in like manner cures many ulcerations in which no venereal poison is suspected. And if any body should imagine that mercury cures those ulcerations by its being an antidote to the poison they contain, such an imagination must be corrected, when it is considered that balsams, and more certainly copper, will answer the purpose of curing those ulcerations as well as mercury. The cure of chancres, therefore, by the application of mercury, does not necessarily infer its power as an antidote; nor do I know any other arguments that can be adduced in favour of such an opinion.

It was however observed above, that the chief reason for supposing that mercury cured by being an antidote, was, that no other good explanation was given how it otherwise cured the disease. But it is incumbent on us to obviate a conclusion we do not admit of; and therefore, that we should attempt a difficult problem, which is, to explain here in what manner mercury does cure the venereal disease. We are well persuaded that it does it by increasing the excretions, by which the poison is thrown out of the body. In support of this opinion we observe, that we have not known any instance of the disease being cured without an excretion taking place. It seems commonly to be especially by the mouth: but we always observe, that this excretion is attended with some degree of inflammation of the mouth; and commonly it is so much as to affect the whole system, so as to induce in

it a phlogistic diathesis. This mark of mercury's stimulating the whole system, with what was said above of its affecting the whole excretories, will sufficiently show, that in its ordinary operation, by its promoting all the excretions, it may thereby evacuate every poison that shall happen to be present in the mass of blood, and may thereby entirely cure the venereal disease. We have said that its chief and most evident operation seems to be in the mouth: but I hold this to be necessary only to show, that mercury, in an active state, has been introduced into the body: and it does not necessarily imply that the venereal poison passes out of the body more readily by the excretories of the saliva than by any other course; for when a salivation is excited, there are at the same time marks of the other excretions being excited. And practitioners now know very well, that by a longer continuance of the other excretions, the disease may be cured without salivation; and if there are instances of salivation's being more effectual than any other measure, it may imply no more than that, in certain cases, a larger quantity of evacuation is necessary than in certain others.

That salivation alone is often not sufficient, I have this proof.—In a venereal patient, a small quantity of mercury very suddenly excited a copious salivation, and which continued to be very copious for many days after. By this the symptoms were in some measure relieved. But, soon after, the salivation ceased and mercury was not further exhibited, but the symptoms returned with as much violence as they had shown before: and it was only by a nice management that mercury, exhibited and employed for a long time, entirely cured the disease. I have had also several instances, in the use of mercury, when salivation happened to arise and continue for some time, without the cure being advanced in proportion to those fits of salivation. It is my opinion, that it is the due continuance of the excretions being increased that affords the most certain cure of the disease. This leads to consider the question, if the disease is to be cured by evacuation, why other evacuations, however diligently employed, do not cure the disease as well as those by mercury? The answer to this may be, that all other evacuations are partial only: they may largely diminish the quantity of the fluids; but they draw them off by one way only, and without being attended with any general increase of excretion. They for the most part diminish all the excretions except that which is on the occasion, by special means, increased; and it is mercury only, that, under proper management, can be employed to increase the whole excretions at the same time. It seems to be by this peculiar mode of operation that it is peculiarly fitted to cure the venereal disease.

When I have thus spoken of the various operations and effects of mercury, it remains to say how these operations are modified by the various preparations of it which have been proposed and employed.

We have said already, that quicksilver, in its native running state, is absolutely inert with respect to the human body; and to render it active for the various purposes we have mentioned, it must be chemically changed. The changes proposed have been many and various; but in my opinion they may all of them be referred to four heads, as the mercury may be changed, *1st*, By being converted into vapour; *2dly*, By calcination; *3dly*, By tincture with viscid fluids; and, *4thly*, By being combined with acids of different kinds.

These various preparations have now been explained and detailed, either in many books of chemistry and pharmacy, or in writings on the venereal disease, so that it does not seem necessary for me to give any particular account of them here. Whoever would consider them more particularly, will find the most ample detail in *Dr. Swediaur's Pharmacopœia Syphilitica*, at the end of his *Practical Observations on Venereal Complaints*: and I shall dismiss the subject here with a very few remarks.

The employment of mercury in vapour may perhaps be the best adapted to some local complaints. But its application to the whole body is attended with so much hazard and uncertainty in the administration, as hardly ever to be an eligible practice.

The preparation by calcination is not, as had been formerly supposed, of any peculiar power or advantage; and is therefore, I believe, little employed in the present practice; justly, as I judge, because the calcination seems to have no other effect than putting the mercury in a condition to be acted upon by the acids of the stomach, and therefore that this preparation does not differ from those made by a combination with acids.

The preparations by triture seem to be milder than those formed by a combination with acids: but from the incomplete triture that happens often to be given, they render the practitioner often uncertain in their use. The triture with unguinous substances gives the advantage of its being introduced by unction upon the skin: and when it has been properly prepared, and is properly administered, it gives a manner of introducing mercury which is often less liable to purging, and therefore more convenient than the employment of the saline preparations.

The saline preparations are different according to the acid employed. Those made by the vegetable acid are milder, and more manageable, than those formed with any of the fossil acids. Of these, the combination with the muriatic acid, when the acid is in its full proportion to the mercury, as it is in the corrosive sublimate, is certainly more active and powerful than any other saline preparation. The use of it has been often convenient and effectual. But its operation is so different in men of different constitutions, that the employment of it often requires a good deal of management and discretion.

It is rendered much milder in the preparation of the *mercurius dulcis*, which has given occasion to this being so frequently

employed; but it does not seem to me to be a very eligible preparation. It does not seem to be so readily diffusible in the system as many others, and that because it is more ready than many others to operate upon the intestines, and run off by stool. This may give it some advantages for its being combined with purgatives; but for that very reason it is less fit for being employed to act upon the salivary glands, or upon the other excretions of the system.

To conclude the subject of the medicinal powers of mercury, it will readily appear, that whoever considers the general deobstruent powers mentioned above, and at the same time the various effects of it when employed as a purgative, will fully apprehend its very extensive use in the practice of physic.

CHAPTER XVIII.

EXPECTORANTIA.

THESE are medicines which facilitate the bringing up the contents of the cavity of the lungs. This, however, must always be done by more or less of coughing: but as we do not know, or at least I do not know, of any internal medicines for exciting this, I have confined my definition of expectorants to be those which cause the contents of the bronchia to be more easily brought up. For the external means that may excite coughing, the ancient Cnidians practised such; but whether our modern practitioners will follow their example, I must leave to a further time to determine.

The rendering the matters for the time present in the bronchia more or less ready to be brought up, must depend upon the nature and state of these matters; but as these may be very various according to the difference of the disease that has poured them out, so we cannot here give any general rule: and it appears to me, that in most cases we can neither increase their quantity, nor otherwise change them so as to render them fit for being more readily brought up.

The case most frequently occurring, and which we understand the best, is when the mucus, which naturally exudes or is poured out from the follicles of the bronchia, is poured out in unusually larger quantity, and often in a more viscid state than can be easily detached from the cells of the bronchia.

It is in this case especially, that expectorants are required; and it is supposed that by their use the mucus may be brought up more largely and with more facility. In what manner, however, they do this, I find it difficult to explain. They might, perhaps, do it by merely exciting coughing: but as said already, I know of no internal medicines capable of doing this: and I must here mention by the way, that I know of no means of exciting coughing with expectoration but by employing vomiting. It may also be observed by the way, that the diseases depending upon an accu-

mulation of mucus in the lungs may be often relieved by medicines which determine to the surface of the body which may diminish the determination to the lungs; and by diminishing the quantity of mucus poured into the bronchia, the expectoration of what remains may be rendered more easy.

These means, however, do not properly touch the business of expectoration: and it is commonly and justly supposed, that the effectual means of expediting this, is by rendering the mucus less viscid, and upon this account more easily detached from the bronchia.

Here therefore it is very universally supposed, by practical physicians, as well as by writers on the *Materia Medica*, that there is place for the medicines named and supposed to be *Attenuantia et Incidentia*; but I suspect that the whole of the theory on this subject is incorrect and mistaken. I am still persuaded by the arguments employed above, that in general no such medicines do exist: and I am clear that those arguments apply as strongly here as in any other case.

But another, and a special consideration, occurs with respect to the present subject: as we maintain, not only that attenuants do not operate, but that there is here no subject for them to operate upon. In spite of all that *Mr. Senac* has said of the existence of a mucus in the mass of blood, neither he nor any one else has brought any evidence of such a matter existing in the circulating mass of our fluids: and it is probable to me that a mucus never appears but in consequence of a stagnation in mucous follicles. Many phenomena show that whenever the secretion of the liquor to be changed into mucus is increased, it is poured out in a very liquid form; and therefore, from its appearance afterwards as a mucus, there is no conclusion to be drawn that any such viscid fluid existed in the mass of blood. We hold it therefore for certain, that in the diseases depending upon an accumulation of mucus in the bronchia, there is no place for the operation of attenuants, as I believe that nobody will fancy they can operate upon the mucus already poured out into the bronchia.

The common theory of expectoration, therefore, seems to be unsatisfying: and the explaining of it in any other way appears to be difficult. The only explanation that I can find probable is, that by increasing the secretion of the liquid that is to afford a mucus, this, as poured from the arterics into the follicles, being always a thin fluid, it may dilute the mucus in the follicles, and may make it to be poured out from these in a less viscid state, and may thereby render it more easy to be brought up by coughing, that is, to be more freely expectorated.

The means, however, of increasing this secretion may not be very obvious. We know no internal medicine that seems to increase the secretion of mucus from the Schneiderian membrane; and whether there are any medicines that can expedite the secretion of the same from the bronchia may be doubtful: but I find it probable that there are truly such.

We know now that there is a constant and considerable exhalation of moisture from the cavity of the lungs: and there are many reasons for believing, that this is an excrementitious secretion, connected with the other excrementitious secretions, particularly with the perspiration from the surface of the body.

If therefore there are medicines disposed to pass by perspiration, it may be presumed that the same are disposed to pass by the exhalation from the lungs. And here therefore is a view of medicines, which, passing through the vessels of the lungs, may possibly operate upon the secretions made there, and particularly the principal one made there, the secretion of the fluid to be changed into mucus. By this, as we have said above, the mucus present in the follicles may be poured out in a less viscid form, and consequently in a state to be more easily brought up by expectoration.

This is the theory of expectorants which we can offer: but how it will apply to explain the operation of particular medicines, I shall leave my readers to determine.

PARTICULAR EXPECTORANTS.

In this list I have first set down a number of the verticillated plants which have had some reputation as expectorants. I have treated of them before in their proper place, and have even there mentioned their supposed expectorant powers; but have said also that these powers have not all been confirmed by my experience.

ENULA CAMPANA.

This, both by its sensible and chemical qualities, promises to be a medicine of some power, and it has commonly been supposed to be so: but after many trials of it I am at a loss to determine what are its peculiar virtues. I have frequently tried it as an expectorant, but never with an evident success. It has been supposed to determine to the uterus; but in the large use of it, we have never met with any symptoms of its having such a power.

IRIS FLORENTINA.

What this might do in its more recent and acrid state, I cannot determine: but in the dried state in which we commonly have it in our shops, we are persuaded of its being a very insignificant expectorant.

TUSSILAGO.

This is a plant, whether we take it in its leaf or flower, of very little sensible quality, and we are afraid of as little virtue. We have very often employed it; but have never found it evidently to be either demulcent or expectorant. There is, however, one virtue of it which I must mention. Upon the testimony and recommendation of Fuller, author of the *Medicina Gymnastica*, I have employed it in scrophulous cases, and in several of these with seeming success.—The expressed juice of the fresh leaves taken to some ounces every day, has in several instances occasioned the healing up of scrophulous sores; and even a

strong decoction of the dried leaves employed as *Fuller* proposes, have seemed to answer the same purpose. We must own, however, that such decoctions have often failed, and that even in some trials the expressed juice was not sufficiently effectual.

PETASITES.

This is a species of the same genus, but of stronger sensible qualities, whereby it might be supposed to have more virtues; and it is agreed that it is more active than the *tussilago farfara*: but how that activity is to be directed, I cannot perceive, either from writers or my own experience. This gives me, however, an opportunity of observing, as I have done before, that I conceive all supposed alexipharmic virtues, such as are ascribed to the *petasites*, to be imaginary and very ill founded.

We have now mentioned, in compliance to the writers on the *materia medica*, a number of supposed expectorants, which we cannot find either suited to the purpose, or in our experience actually useful. But there are two medicines set down in my list of expectorants, which I am persuaded may be really useful as such, as they are medicines which manifestly stimulate the excretories which they any where reach. These medicines are the *Nicotiana* and *Scilla*: the former we have treated of already; and the latter we shall have occasion hereafter to mention, as emetic, purgative, and diuretic: and as in these operations, it gives unquestionable marks of its power in stimulating excretories, so we shall be more readily allowed to consider it, as what it has been commonly supposed to be, a powerful expectorant. With respect to its employment as such, it is hardly necessary to observe, that it must be given in such small doses as may not occasion its acting upon the stomach or intestines; as the one would prevent its being frequently repeated, and the other would prevent its passing into the mass of blood, where its action as an expectorant can only take place. Its acting as a diuretic is always a mark of its having entered the mass of blood: and it is my opinion, that it is not to be expected to act as an expectorant but when it appears also to act upon the kidneys.

With respect to its pharmaceutical treatment, I must observe that it is never properly employed in its fresh state; as in that condition it so readily affects the stomach as to prevent its being given in due quantity; and therefore it cannot be so well directed to its operations. I would therefore have it almost always employed in its dried state, when that is properly executed, and the powder is afterwards not long kept. In this state it may either be employed, as we speak, in substance, or it may be extracted by different menstrua: and I mention this only to observe, that we cannot find any advantage in extracting it by vinegar: which is the less proper, as, in spite of almost every precaution, vinegar will be in different conditions. We maintain that, in every respect, wine will be a more proper and certain menstruum, especially when the same quantity of ardent

spirits is added as in the acetum of the London College. In that of the Edinburgh Dispensatory, I cannot find the management of the ardent spirit so properly managed ; as I find that the addition of a quantity of brandy, either with vinegar or wine, would not be unfavourable to the extraction of the squills.

At the end of my list of expectorants, I have set down some medicines which have been supposed to be expectorants : but having treated of each of them before, and having given my opinion with respect to their use in the affections of the lungs, which comprehends the business of expectoration ; so I cannot think it necessary to repeat any part of it here.

CHAPTER XIX.

E M E T I C A.

THESE are medicines which excite vomiting, and thereby bring up and throw out the contents of the stomach for the time present in it. As, upon other subjects, so I shall here, first mention what may be the effects in general or in particular, and afterwards say by what means these are to be obtained.

Although the contents of the stomach may be supposed nowise morbid or noxious, some physicians have been of opinion, that the action of vomiting, and the evacuation of the stomach, may be useful to health ; and I am ready to believe, that the moderate practice of this may be useful, both by its exciting the activity of the stomach itself, and by agitating, as vomiting does, the whole body : but I am certain that the practice ought not to be frequent : and I have known instances of the frequency of it being hurtful, by rendering the stomach less fit to retain what is thrown into it, and even to weaken its powers of digestion.

When, however, the contents of the stomach may be supposed to be in a morbid state, and noxious to the stomach itself, or to the whole system, there can be no question or doubt about the propriety of vomiting, except in a few cases, when the action of vomiting may be hurtful to certain conditions of other parts of the body, or when the vomiting cannot be excited but with such straining as may be hurtful to the parts especially concerned in the action, and likewise to other parts of the system.

When such exceptions do not present themselves, it will always be proper to excite vomiting, not only for throwing out the matters as noxious, but frequently also as being ferments to the aliments that are to be afterwards taken in.

The marks of the matter's being noxious by its quality or quantity, are especially the want of the usual appetite ; and often not only a want of appetite, but a loathing of food : or when aliments are taken in, an uneasiness in the time of their digestion, and marks of its imperfect condition ; such as heart-burn, flatulent and acid eructations : and to these may be added frequent head-achs.

These are the marks of noxious matters present in the stomach. They indicate the use of vomiting and the evacuation of the present contents of the stomach, which gives generally more or less of relief. But it is very necessary to be marked, that this relief is seldom very durable as the noxious matters are more frequently to be considered as effects than as causes. The production of them very commonly depends upon a loss of tone in the muscular fibres of the stomach, which is not to be cured by vomiting, though the effects of it may be relieved by this for a longer or shorter time. They are, however, unhappy who trust to this mode of relief, and have therefore frequent recourse to it; for I am certain, from much experience, that frequent vomiting hurts the tone of the stomach, and often makes the symptoms of indigestion recur more frequently and sooner than they otherwise would have done.

Upon this subject I judge it proper to remark, that the effects of vomiting, and the degree of disease that required it, are commonly judged of, both by the vulgar, and even by physicians, though not always fairly, by the appearance of the matter thrown up. For example, there is commonly thrown up a considerable quantity of very viscid mucus: and to this the symptoms of the disease are frequently imputed.

It is indeed possible, that an unusual accumulation of mucus in the stomach may be the cause of the want of appetite and other symptoms of indigestion: but not always so justly as might be imagined. The mucous follicles of the stomach constantly pour out a considerable quantity of this matter; a considerable quantity of it is to be found in the stomachs of the most healthy persons: and the experiments of Mr. Senac show, that there is always a considerable quantity of it in the mucous follicles, which may very readily be squeezed out very copiously in vomiting. It is not therefore to be judged that the quantity, and even a large quantity, thrown up by vomiting, had either previously existed in the cavity of the stomach, or that such a mucus had been the cause of the morbid symptoms, indicating therefore the repetition of vomiting. It has been upon occasions of this practice that I have known repeated vomiting not only to give no durable relief, but rather to increase the supposed cause.

The effects of emetics and of vomiting first to be mentioned, are those of evacuating the stomach itself: but it is now to be remarked that the evacuation goes further; and the duodenum, with a portion of the jejunum, may be, and commonly is, evacuated at the same time. The peristaltic motion of the alimentary canal may proceed downwards or upwards; and when any portion of it acting is, by any circumstance, directed in one way, the next adjoining portion follows the same direction. From this, in vomiting, as the peristaltic motion of the stomach is directed upwards: so the motion of the duodenum is directed in the same manner, and pours its contents into the stomach; from

which it will appear, that in vomiting, a considerable portion of the upper part of the intestines may be evacuated, as we have alleged.

The most clear proof of the inverted motion of the duodenum is, that in vomiting, and especially after repeated vomiting, a quantity of bile seems to be poured from the duodenum into the stomach, and is in consequence thrown out of the mouth. This frequent appearance may depend entirely upon the quantity of bile for the time present in the duodenum: but it probably extends farther. When in consequence of digestion, alimentary matters pass into the duodenum, as it may be supposed that Nature intends the gall-bladder and biliary ducts should then pour their fluids more copiously into the duodenum; so it may be supposed, on this occasion, that bile is poured more copiously into the duodenum, and, in consequence of the inverted motion, more copiously into the stomach, from whence it may appear more copiously in what is thrown up by vomiting. If this should not be though sufficient to account for a quantity of bile being frequently thrown up by vomiting, there is another cause, perhaps one more powerful, to be alleged. In the action of vomiting, as the contraction of the diaphragm and of the abdominal muscles concurs at the same time, the whole viscera of the abdomen are strongly pressed: this pressure must affect the gall-bladder and biliary ducts, and occasion them to pour out their contents very largely; and thereby especially a large portion of bile may be thrown up by vomiting.

On this subject I must remark, that both the vulgar, and even physicians, have been ready to suppose, that the bile thrown up by vomiting existed previously in the stomach itself: and in some instances it may have been so. But it is more probable that it has been brought from the duodenum, and even from the gall-bladder and biliary ducts, in the manner we have explained. There is this particular reason for supposing it, that if the bile had been previously lodged in the stomach itself, it might have appeared in the first vomitings as well as in the last: but it happens in most instances, that the bile is thrown out by the mouth only after repeated vomitings, and often after repeated strainings in the organs employed in vomiting.

After the evacuation of the stomach, the next effect of vomiting to be marked, is this evacuation of bile, in consequence of the mechanism we have explained; and of what importance this may be in many diseases, will be sufficiently obvious. That the stagnations ready to happen in the system of the vena portarum often lay the foundation of the most obstinate diseases, is well known: and therefore, the obviating these by frequent vomiting is likely to be of much importance to the health of the system: and indeed I know no means of expediting the circulation in the liver so powerful as that of vomiting.

An effect of vomiting, which, as it may be considerable, deserves to be taken notice of, is, that the compression which we

have mentioned to be given to the liver, must at the same time be given to the whole viscera of the abdomen; by which the motion of the blood in their vessels, and the whole of the secretions and excretions in every part of them, may be promoted, and thereby diseases both prevented and cured.

These effects, however, in the abdominal viscera, are not often remarkable; but the effects of the same motion in the thoracic viscera are often evident and considerable. The simultaneous contractions of the diaphragm and abdominal muscles, and the alternate relaxations of those organs of respiration, must variously agitate the motion of the air in the bronchia, and thereby expectoration be most effectually promoted. Both by this, and the agitation of the blood-vessels, it will be obvious that vomiting may be often useful, as we commonly find it to be, in all catarrhal affections. That it may be also useful in many cases of phthisis pulmonalis we readily allow; but that frequent vomiting may cure the disease, we cannot, either from theory or experience, find any reasons to believe.

Besides these operations on the trunk of the body, vomiting excites the force of the circulation in every part of the system, and may thereby be of much use. But as such increased circulation is not durable, and that it commonly becomes languid in proportion to its former increase, so it may be justly doubted if the general stimulus can be commonly of much service. But although the general action of full vomiting may not be considerable, yet as directed and operating in particular parts, it may become of great use. Thus we are of opinion, that there is a special consent between the stomach and the vessels on the surface of the body, so that the several states of these are mutually communicated to one another; whence the action of vomiting excites particularly the action of the vessels on the surface of the body, and may thereby be of use in restoring the tone, and overcoming the spasm of the extreme vessels which takes place in fevers.

It is here, however, to be remarked, that as the effects of full vomiting cannot be durable, nor its operation be conveniently repeated; so full vomiting cannot always be employed to prevent the recurrence of the atony and spasm mentioned. But as emetics, though employed in doses not sufficient to excite full vomiting, may still excite a degree of action in the stomach, and be communicated to the extreme vessels, so as in some measure to restore their tone, and overcome the spasm affecting them, they may thus be useful in fevers: and as their operation may be rendered more durable than full vomitings, these nauseating doses may be still more useful.—Upon this is founded the present practice in employing emetics in the cure of fevers. But as I have explained all this more fully in my *First Lines*, it is not necessary to insist further upon it here.

There is an operation of emetics further to be mentioned,

which, in my opinion, depends upon their power of determining to the surface of the body; for to this I refer their use in asthma, so much recommended by *Dr. Aikenside*. I cannot, indeed, say that I have imitated his practice with much success; for in many cases of spasmodic asthma, I have continued the use of emetics for a long time, without finding that I either prevented the recurrence of fits, or rendered them more moderate when they came. But in some other cases I have found the emetics of benefit in both respects; which, however, happened especially when the asthma was in any degree of the pituitous or catarrhal kind; and therefore the emetics were of more service in the winter than in the summer asthma.

Of the effects of vomiting and of emetics, so far as I can judge, it remains only to take notice of their employment in hæmorrhagy, which to me presents a difficult problem.

Dr. Brian Robinson, lately of Dublin, has recommended frequent vomiting in hæmoptysis, and has assured us of its good effects in several cases. Upon the recommendation of so good authority, I tried this remedy in several cases: and in several I found it might be employed with safety and advantage. But in one case, the vomiting increased the hæmorrhagy to a great and dangerous degree: and the possibility of such an accident again happening, has prevented all my further trials of such a remedy.

I can, however, conceive that the remedy may be safely employed in many cases, and that really it had, in those in which it was employed by *Dr. Robinson*, been of advantage, by taking off the determination of the blood to the lungs; as I had in more than one instance found, that the exercise of a carriage, employed to a considerable degree for several days together, took off entirely a hæmoptysis, which readily returned upon the person's remaining for a day or two at rest.

It is thus that I would explain the effects of vomiting in a hæmoptysis. But this was not the theory of *Dr. Robinson*. He seems to have been of opinion, that during the sickness that introduces vomiting, there is a constriction formed upon the extreme vessels every where; and that by this constriction the hæmoptysis was suppressed. Of the justness of this theory I leave my speculating readers to judge: but what I must add seems to be in confirmation of it. It has been found, and I myself in some instances have found, that nauseating doses of emetics have been of service in several instances of uterine hæmorrhagies: and *materia medica* writers have commonly alleged, that small doses of emetics have been employed in many different cases of hæmorrhagy with great advantage.

Having now mentioned pretty fully the effects of vomiting and of emetics, I am next to consider the several means which may be employed for obtaining these.

Vomiting may be excited by very various means; of which, however, many of them cannot be employed in practice, and are

therefore, not to be taken notice of here.—Among the means that may be employed, the first I would mention, as very generally employed, is filling the stomach suddenly with a large quantity of liquid; and it is found that almost any kind of liquid, in large quantity, will have the effect: but that the vomiting depends not on the quality, but on the quantity of liquid, appears clearly from hence, that warm water, of the most pure and simple kind, is generally sufficient for the purpose.

The theory of this frequent operation has not, in my opinion, been well explained. It seems therefore allowable for me to attempt to do it here.

As, when meats or drinks are taken into the stomach, it is necessary that they should be retained there for some time, till they shall have undergone certain changes, by operations to be made upon them in the stomach; and therefore, that they may not pass off too soon by the lower orifice, nature has provided, that on every distension of the stomach, the pylorus should be raised up by the longitudinal fibres, which in the small curvature of the stomach pass between its two orifices, and at the same time be contracted by the muscular fibres placed in the duplicate of the coats of the stomach formed near to the pylorus. This constriction in ordinary cases is moderate. But we know it can be so strong as to shut up that orifice entirely: and it is probable that this, as seems necessary, should always happen in vomiting. It is also probable, that this contributes to occasion the vomiting; as this constriction of the pylorus must invert the peristaltic motion of the stomach, and direct it entirely upwards, and even to a vomiting. If it can therefore be supposed, as I think it may, that the sudden distension of the stomach, by a large draught of warm water, can induce a strong contraction of the pylorus, we shall readily understand how it produces vomiting, and at least contributes to promote it.

Having thus attempted to explain the operation of warm water, which is very much confirmed by what was observed above of the effects of a large bulk of liquid thrown suddenly into the stomach, we proceed to speak of some applications of it in practice.

The effect, we have said, may be produced by warm water alone; but more readily still, when at the same time an emetic medicine is applied to the stomach. These emetics we shall speak of presently: but now it is only necessary to remark, that in many cases, when it may be proper to give the emetic in such a dose as of itself might be sufficient to excite vomiting, by the assistance of filling the stomach with warm water, small doses of emetics may serve the purpose of evacuating the stomach, and even of obtaining other effects, which we have said may be produced by vomiting.—This shows sufficiently the power and operation of warm water employed in the manner we have said: and it is particularly in illustration of the same that several substances of little power in stimulating the stomach, are, however,

by the assistance mentioned, employed to excite vomiting, such as the infusions of a bitter herb, as chamomile, or carduus benedictus.

On the same footing it is that certain substances which stimulate the stomach more powerfully, but which, on account of their inflammatory nature, cannot be safely given in such quantity as by themselves to excite vomiting, may, by the assistance of warm water, and by that only, be employed as very safe and useful emetics. Such are an infusion of the root of horse-radish, or a tea-spoonful of mustard as prepared for the table. These are emetics that can hardly be rendered effectual, or be employed, but by the assistance of warm water. With that assistance, however, they afford a gentle and useful means of exciting vomiting.

But we must now speak of those substances which of themselves, when introduced into the stomach, can excite this action of it.

Of these I have, according to my general plan, set down, in the first place, those taken from the fossil kingdom: but from several considerations I find it proper to begin with treating of those taken from vegetables.

ASARUM.

This, in ancient times, was frequently employed; but since physicians became acquainted with antimonial emetics, it has been very little in use; though we can say, from our own experience, that it is sufficiently fit for the purpose. The root, dried only so much as to be powdered, proves, in a moderate dose, a gentle emetic. It will commonly answer in doses of a scruple, sometimes in a less quantity: and though given as some authors have proposed, in larger doses, it may be safe; as commonly a quantity of it will be thrown out in the first vomitings. In repeated vomitings the whole of it is thrown out; so that it is always a moderate and manageable emetic, and as we judge, may be suited to many of the purposes of the ipecacuanha. It appears from writers, that the leaves also have been commonly employed, and perhaps with equal advantage; but as I did not find it easy to ascertain the dose of these, my experiments have been only with the roots.

ERIGERUM.

This is a more acrid substance than the materia medica writers seem to have supposed it to be: but from them I have no accounts of it that can lead me to any observation. It has been sometimes by our lower people employed as a powerful emetic; but I have not had any proper information upon this subject. It is not on that account that it has been inserted in my catalogue; but it was, to direct my reader's attention to the singular power of it externally applied, as reported by my learned friend, *Dr. Steedman*, in the *Edinburgh Medical Essays*, Vol. II. art. v.

IPECACUANHA.

It does not seem as yet to be well ascertained what genus of

plants this celebrated root belongs to, or if to one genus only ; but not being fit of myself to settle this matter properly, I must leave it entirely to the botanical critics. For my purpose at present it is enough to observe, that what for a long time past has been brought into our shops, seems to have been very uniformly the same : and it is this that has been the subject of my observation and experience, and therefore what I am to say now relates entirely to this.

This root then consists of a cortical and medullary part : and I am from some experiments persuaded, that it is in the former only that the emetic quality is to be found. In this cortical part it seems to be a resinous matter ; and accordingly it may be extracted by spirit of wine : but at the same time the resinous matter is so intimately blended with, and adheres so tenaciously to, the gummy portion, that the emetic quality can be very well extracted by more watery menstruums. Dr. Lewis advises a menstruum of one part pure spirit, and two or three parts of water. This perhaps may be the most proper : but a thin wine answers the purpose very well ; and our Dispensatories have not thought of employing any other.

This medicine is employed either in the wine or in the powder ; and the latter, as operating in a smaller dose, gives a more manageable emetic : for the powder is pretty certainly thrown out in the first vomitings, and therefore ceases to operate, whilst the wine often adheres longer to the stomach.

The medicine in either form proves very certainly emetic : and the powder, to the quantity of a grain, and perhaps less in many persons, can hardly be given without exciting nausea, and perhaps vomiting. Such small doses do not indeed always produce these effects : but as they frequently do, we mention them to shew that small quantities often operate upon the stomach : and the instances of it make me ready to believe the accounts which have been reported of the cure of diseases by very small doses of this medicine.

Among these reports I have difficulty in giving faith to those of Dr. Pye, reported in the London Medical Observations, Vol. I. art. 22. whilst he gives no account of the nature of the ipecacuanha that he employed, as different from, or of superior power to, that in common use with us. In this, though I have often observed in certain persons the effects of small doses above mentioned, yet they are not to be observed in every person : and I can assert, that in nine persons of ten they will hardly appear from doses under five grains. For exciting vomiting, and especially to excite repeated vomitings, we hardly depend on any dose under ten grains : and frequently a larger dose is required. It appears to me, that the small doses would hardly answer our purpose without the assistance of warm water. Larger doses indeed may be given with safety ; because, as we have said, they are commonly thrown out in the first vomitings : but even on this

account, they do not answer the purpose that may be required of repeated vomiting: and our practitioners commonly find, that to give any powerful or permanent stimulus to the stomach, it is necessary to add to the ipecacuanha some portion of emetic tartar.

Ipecacuanha may have all the effects which we have above ascribed to emetics in general; and upon that ground the medicinal powers of this medicine may be understood. But I shall here make a few remarks that more particularly relate to it. We have just now explained why it is not with any certainty suited to give a powerful or permanent stimulus to the stomach: but on this very account for the mere evacuation of the contents of the stomach, it is the medicine that can be employed with the greatest ease and safety: and wherever it is proper to employ a moderate vomiting only, as for promoting the passage of a biliary concretion through the biliary ducts, it is the most proper emetic; as its stimulus may be safe, and at the same time more effectual than the other gentle means of exciting vomiting which we have mentioned above.

Although ipecacuanha is seldom fitted to produce the effects of strong vomiting, it is, by the mildness of its qualities, adapted to several useful purposes. As small doses of it, not sufficient to excite vomiting, pass over the pylorus, they pretty certainly act upon the intestines, promote their peristaltic motion downwards, and commonly occasion more or less of evacuation by stool: and it is upon this that I suppose to have been founded the formerly celebrated antidysenteric virtue of ipecacuanha.

If I am right in my opinion of the nature of dysentery, as I have explained it in my First Lines, it will be evident, *a priori*, that the cure of it, must depend upon the steady support and determination of the peristaltic motion of the intestines downwards: and it seems to be as certainly proved in fact, that the cure is best obtained by the assiduous use of laxative or purgative medicines. From what experience we have had we are persuaded that wherever neither inflammation nor putrescency have taken place, a dysentery will always be readily cured by these means.

Whatever explanations have been offered, of the operation of ipecacuanha in this disease, we can find no other admissible or tenable, but that of its laxative power: and in confirmation of this, it has been often observed, that ipecacuanha does not answer the purpose, unless when it proves more or less purgative; and a confirmation of the same occurs more strongly from this, that other emetics proving laxative are equally or more effectual. See the learned Sir George Baker, *De Dysentaria*, p. 26.

There have been many other virtues ascribed to the ipecacuanha: but all of them appear to me to depend upon its emetic powers alone, and that they truly may be obtained by the use of other emetics. We might therefore cease from saying more of this drug: but I shall still make a remark or two on some particular uses of it.

It has been particularly commended in the cure of intermit-
tent fevers: and I knew a practitioner who cured these, by giv-
ing, an hour before an accession that was expected, five grains,
or so much as would occasion a strong degree of nausea and
sickness, without vomiting: and by one or two such practices
he was frequently successful. It is true that this may be exe-
cuted by tartar emetic: and I recommended the trial of this to
the practitioner I speak of. But he assured me, that in several
trials he could not easily adjust the dose of this, so as to produce
the proper degree of sickness without vomiting, so well as he
could do by the other.

Dr. Thomson, formerly of Montrose, proposed to cure agues
by the employment of emetics given at the time of accession, or
at the end of the cold stage: and this practice has also been suc-
cessful, and may indeed be executed by tartar emetic: but in
trying such practices, I have found the ipecacuanha more ma-
nageable than the other, and generally to be more easy to the
patient.

The mildness and manageable quality of the ipecacuanha has
made some physicians endeavour to employ it in continued fe-
vers. But we have always observed, that the readiness with
which even small quantities excite vomiting, and are to be
thrown out by it, commonly prevented our obtaining that per-
manent nausea that we judge to be necessary.

To finish my remarks upon this medicine, I have to observe,
that, like other emetics, it has been employed in the cure of
hæmorrhagics. And if their salutary effects, in such cases es-
pecially depend upon inducing the first degrees of nausea, I leave
it to the ingenious practitioner to judge, whether the small quan-
tities in which ipecacuanha will operate, may not render this a
fitter medicine than some other emetics.

After the ipecacuanha, in my catalogue, I have set down the
Nicotiana: but in treating of this above as a sedative, as I have
said all that is necessary with respect to its being employed as
an emetic, it seems unnecessary to repeat any thing of it here.

The next article is that of

SCILLA.

This, with its expectorant and diuretic powers, has always
joined that of stimulating the stomach and of exciting vomiting.

For this single purpose it was sometimes formerly employed;
but since the use of ipecacuanha has become known, the squills
have been more rarely used: and in my opinion they have been
justly neglected; as I find the dose of them not to be easily as-
certained; and in a full dose they appear to me to be a harsher
and less manageable emetic than the ipecacuanha.

We cannot however pass this subject without observing, that
we can never presume upon the operation of squills in any man-
ner, without their being given in such quantity as to excite some
degree of nausea, a circumstance that renders the squills a dis-

agreeable remedy; but an attention to it seems to be always necessary.

We have now mentioned the vegetable emetics of our catalogue, that are necessary to be taken notice of here; as to what relates to the use of the *Amara*, the *Sinapi*, and *Raphanus Rusticanus*, we have spoken of fully enough above, either as assistants to the operation of warm water, or as by the assistance of that they may become useful emetics.

Having therefore now considered the vegetable emetics, I am next to take up the subject of the fossil.

The first of these mentioned in my list are the preparations of copper. And many of these, as very universally emetic, might perhaps be employed: but they are seldom fit to be safely or properly managed.

I have known the Blue Vitriol employed, but rather as a nauseating dose in the beginning of fevers, or as a diuretic in drop-sies, than as an emetic fit to occasion full vomiting: and when it has the last mentioned effect, it is always harsh and unmanageable, and we cannot perceive that it has any better effects than those of tartar emetic. The effects of it in beginning consumptions, we have not had any experience of. Its external use as an escharotic is sufficiently known: but I must observe, that in many ulcerations it has appeared to me more useful than any other: and very lately, in an ill-conditioned and spreading ulcer, I found it bring on a good digestion, when both mercurials and arsenic had failed.

With respect to the mercurial emetic, I believe that most of the saline preparations of mercury, if given in large doses, might operate as emetics: but, as in the examples of the corrosive sublimate, they would be employed with very great danger. The mercurial emetic that has been chiefly and almost only employed, is the turpethum mineral, or *mercurius emeticus flavus*: but as this must be employed in a very large dose, and always operates in a severe and dangerous manner, I am disposed to assert, that it is never necessary to use it for the purpose it was formerly employed, that is, to excite a salivation; nor that it is ever necessary for removing some obstinate venereal symptoms, such as swelled testicles; as I believe that such symptoms may be as well cured by safer means.

Of the preparations of zinc, the vitriolum album, is that only employed as an emetic. This has been chiefly employed on account of the suddenness of its operation, which is frequently required when noxious or poisonous matters have been accidentally taken into the stomach. We do not, however, always find the white vitriol to be the most convenient for this purpose: for in order to render its effect certain, the dose must generally be large; and if this is not thrown out again immediately, it is apt to continue a disagreeable nausea, or even a vomiting, longer than is necessary.

I find that the purpose of this medicine, that is, a sudden vomiting, may commonly be obtained by employing a large dose of ipecacuanha, either in powder or in the vinum; and by following this soon after with a large draught of warm water, impregnated with chamomile, or rather with what is more at hand, a tea-spoonful of table mustard, the business may be commonly very effectually executed.

ANTIMONIUM.

This, under a certain preparation, affords the metallic emetic now most commonly employed. It is one of the safest and most manageable, and may commonly be rendered sufficiently effectual for every purpose of emetics.

With respect to it, this is first to be observed, that, as produced in the earth, it is a combination of a metallic substance with common sulphur; and while it is in this state, when we name it Crude Antimony, it appears to me to be an inert substance with respect to the human body.

This, however, is not the universal opinion; and its manifest effects upon horses favours the supposition, that it may have effects also on the human body. Many physicians have adopted the supposition; and particularly the chemist Kunckel alleged, that by levigation brought into a very fine powder, it was useful in several diseases, particularly in rheumatism. After several trials, however, of giving a drachm of this powder once or twice a-day for several weeks together, I have not found it of any benefit. I knew a physician who had an opinion of its being useful in cancers: and he gave the powdered antimony to two drachms for a dose; but I could never perceive that any sensible effects, or that any effects either upon the cancerous tumour or ulcer were produced. I must own, however, that in one or two instances in which the crude antimony was largely employed, some nausea, and even vomiting, were produced; so that I was restrained from carrying the dose farther than I had already done. This indeed, obliges me to acknowledge, that on some occasions, crude antimony may be an active medicine: but at the same time I must allege, that it can hardly ever be proper to employ such an uncertain medicine as the crude antimony, when I suppose we may obtain the same effects by one of its preparations, whose dose and operation can be more exactly measured.

Supposing, therefore, the crude antimony laid aside as at least generally inert, we are next to inquire into the means of bringing it into an active state. What are the means of giving it activity, we shall endeavour to point out very fully hereafter: but, as in other instances of this treatise, I think it proper to consider first the general effects of it in all its active states.

These are universally and constantly its exciting vomiting, or such a degree of action on the stomach, as is common to other emetics given in such doses as do not excite full vomiting. The medicinal effects of antimony, therefore, are all those which we

ascribe to full vomiting, or to the more partial operation of emetics, as above explained.

But antimony, in its active states, differs from other emetics. When it is employed either to excite full vomiting, or to produce a more partial affection, the stimulus given by it to the stomach is stronger than that of ipecacuanha: and therefore it excites the action of the parts employed, in vomiting in a stronger degree. It therefore more powerfully evacuates the stomach: and as it is not so readily thrown out again, it is fitter to excite repeated vomitings, and thereby to occasion a more complete evacuation.

It will at the same time be obvious, that the same force of stimulus will produce more certainly all the effects we have ascribed to full vomiting in evacuating the upper part of the intestines, in emulging the biliary ducts, and in expeding the motion of the blood in the vessels of the liver, or in the other abdominal viscera.

It is equally obvious that the same force of stimulus applied to the stomach will be more certainly communicated to the surface of the body, and thereby show the effects of nauseating doses in fevers, and in many cutaneous disorders. Farther, whatever virtues may have been ascribed to ipecacuanha in asthma and hæmorrhages, I have found, by experience, they may be generally obtained by a proper management of antimony: and upon the whole from what has been now said, I hope we may have a pretty complete view of the medicinal virtues of this celebrated medicine.

Having now spoken of these virtues, I am next to say how they are to be obtained; that is to say, how, from the crude antimony, which we consider as inert, the most active antimonial medicines are to be obtained.

To this purpose we suppose it agreed upon, that the sulphur of crude antimony does not differ from common sulphur; and therefore, that peculiar medicinal virtues are to be obtained only from its metallic, or, as it is commonly named, its Reguline part.

With respect to this, however, it is in the *first* place to be observed, that, like all other metallic substances, this, in its pure metallic state, is absolutely inert with respect to the human body; and that, in order to its becoming active, it must be brought into a saline state, either by its being combined with an acid before it is introduced into the body, or by its being brought into a state in which it may be acted upon by the acids it may meet with in the stomach.

The execution of either of these purposes has given much employment to the chemists, and has produced all the various preparations, as they are justly called, of antimony. The present state of chemistry, however, is so complete and correct with respect to antimony, and the pharmaceutic treatment of it is so commonly understood, and so clearly delivered in all our books of chemistry and pharmacy, that it is not very necessary for me to repeat it here. But for the sake of a few remarks that I have to offer, I beg leave to attempt a short system on the subject.

I begin with those means of putting antimony into a state in which it may be acted upon by the acids of the stomach.

It is in this state, particularly when it is a pure regulus, entirely free from the sulphur with which it had been joined in its native state; and in this reguline state, it may, for reasons we shall give hereafter, be thrown into the stomach in large quantity.

But here it may be proper to remark, that as antimony may be brought into its reguline state by various means, and particularly by various other metals employed for absorbing and separating the sulphur of the crude antimony; so it has been imagined, that, according to the metal employed, there was some difference to be found in the regulus obtained: but it has now been discovered, that there is little foundation for this either with a view to chemistry or medicine.

Although the regulus might be, it is now seldom, employed as a medicine; and especially as it is found to be enough to have it free from a part of that sulphur which prevented it from being acted upon by acids in its crude state; and it is found that the abstraction of a portion of that sulphur is commonly sufficient for putting it into a state in which it may be acted upon by acids even of the mildest kind. Accordingly, for rendering it fit to be acted upon by the acids of the stomach, the chemists have contrived the various preparations by which more or less of the sulphur is abstracted from the crude antimony.

It may be done, in the *first* place, by a proper calcination, to such a degree, that the remaining matter may be fused into a glass, which we find to be readily acted upon by acids, and to show the same emetic qualities that are to be found in any other active preparation. This vitrum antimonii is found to be so readily soluble as to prove one of the most active preparations. But it is proper to be remarked here, that this preparation may be rendered milder by some calcination with wax, as in preparing the vitrum antimonii ceratum. The theory of this operation is not very obvious: but I can assert, that the mildness of the preparation depends upon the degree of calcination given; for I know from experiment, that by pushing the calcination beyond a certain degree, the medicine can be rendered absolutely inert, and no longer soluble in acids.

A second means of abstracting a portion of the sulphur of antimony, is by the application of alkalines. This may be done first by fusing antimony with a portion of alkaline salt; which abstracts a part of the sulphur, and with it forms a scoria upon the surface of the melted mass, while the part subsiding from that gives the regulus medicinalis of *Hoffman* and others. This is soluble in acids; and, thrown into the stomach, shows emetic qualities; but which are commonly in a moderate degree.

A more common practice for abstracting the sulphur of antimony, is by applying to it a caustic alkaline lixivium.—This, applied with a boiling heat, readily dissolves a considerable portion

of the sulphur of antimony, and in greater proportion than it does the reguline part, though at the same time a portion of this is also taken up. That part of the sulphur which has the greatest proportion of reguline matter adhering to it, cannot be suspended but by a boiling heat: and therefore, upon the cooling of the lixivium, this falls down to the bottom of the vessel in the form of a reddish powder, which is named *Kermes Mineral*.

The other portion of the regulus taken up by the lixivium may be readily separated from it by the addition of an acid: and the matter in that case precipitated is what was named the Sulphur Auratum, and now the Sulphur Antimonii Præcipitatum.

In both these preparations, the Kermes mineral and sulphur auratum, the proportion of sulphur is not, with respect to the reguline part, so great as to prevent this from being acted upon by acids: and therefore, thrown into the stomach, it proves an active medicine. Both the Colleges of London and Edinburgh seem to think these medicines nearly of the same quality, by their prescribing only the sulphur antimonii præcipitatum, and giving no place to the Kermes mineral. But I am humbly of opinion, that the latter is the more active medicine, and is more uniformly the same, in different preparations, than the former.

A third, and the most ordinary means of abstracting the sulphur of antimony, is by the application of nitre; which, when the two substances are together exposed to the action of the fire, deflagrates with, and dissipates the sulphur. The effect of this is different according to the proportion in which the nitre is applied to the antimony.

If somewhat less than a fourth part of the nitre be applied, a portion of the sulphur is abstracted; and so much, that the remaining mass may be acted upon by acids, and gives what is much the same with the regulus medicinalis mentioned before.

If the proportion of nitre is equal to that of the antimony, the matter remaining after deflagration makes the noted crocus metallorum, readily soluble in vegetable acids; and therefore, thrown into the stomach, gives one of the most acrid preparations of antimony. But if the proportion of the nitre be still farther increased as to double the quantity of the antimony, the sulphur of this is not only dissipated, but the metal is at the same time calcined, so as to be less soluble in acids than the crocus. In this state, however, it commonly remains so far soluble as to give the Emeticum mite of Boerhaave.

In treating antimony with nitre, if the antimony be calcined so far as to render it fit to be fused into a glass, and in this state be deflagrated with an equal part of nitre, the calx nitrata of the Edinburgh Dispensatory is produced; which is a matter still soluble in acids, in that respect very much in the condition of the emeticum mite just now mentioned.

It is supposed that the celebrated James's powder is very much the same with the calx nitrata: and the appearance of the two pow-

ders, the dose in which they may be employed, and their operation in the stomach, renders this to me very probable.

Lastly, if the nitre applied to the antimony, be in the proportion of three parts to one of antimony, this is more entirely calcined, and rendered absolutely insoluble in vegetable acids. It is what is named the *Antimonium Diaphoreticum*, or *Antimonium Calcinatum*; a substance formerly supposed by many to be of some power and virtue: but the Edinburgh College are so far from thinking so, that they have not given it a place in the last edition of their *Dispensatory*.

These are the chief of the preparations still retained in use, in which antimony is put into a state of being acted upon by vegetable acids; and therefore, when thrown into the stomach, to show more or less of an emetic power; and they seem to be different from one another only by the quantity of the reguline part in them being more or less in a soluble state.

It is hardly necessary to observe, that the operation of these several preparations seems to be also different according to the quantity, and perhaps the quality, of the acid that they meet with in the stomach; and therefore that their operation is so different in different persons, and even in the same person, at different times.

After treating of these preparations, we must in the next place mention those which may be made by a combination of the regulus of antimony with acids, before its being thrown into the body.

Of the fossil acids, it is to me doubtful if either the nitrous or vitriolic can be managed so as to give an active antimonial preparation: but the muriatic is in this respect very powerful.

Antimony, combined with the muriatic acid, in a fluid form, gives the strong caustic fluid, named *Butter of Antimony*, and which we have spoken of above under the head of *Corrosives*. From this, however, the acid can be abstracted to such a degree, that the combination may be brought into the form of a crystalized salt, which has been named *Mercurius Vitæ*. This has been formerly employed in practice as an emetic: but its operation is so violent, that the present practice entirely avoids it.

There remains therefore only to speak of the vegetable acids, which may be applied to antimony to give an emetic of the kind we now treat of.

The liquid vegetable acids have been, in their several states, employed for this purpose. But as their different states are not easily ascertained to be at different times the same, they have been all laid aside: and wine, which always contains a sufficient portion of acid, is the only menstruum now employed. Most of the wines in common use might be employed; but both the Colleges have agreed to employ the common Spanish white wine only. The London College applies this to the *crocus metallorum*: but the Edingburgh applies it to the *vitrum antimonii*,

with, however, no different effect in the two preparations that I can perceive. The two Colleges employ the menstruum in a different proportion with respect to the ingredients they employ: but this makes no difference; as the wine dissolves only a certain quantity in proportion to its own bulk, which it can always take from the ingredient that is in the smallest proportion to the whole of the wine employed, and this at least in the quantity of wine that is applied in our Dispensatories. This also explains a circumstance well known to practitioners; which is, that if due care be taken to separate, by a filtration, the ingredient from the wine, the dose of this is never to be estimated by the proportion of the ingredient infused, but merely and exactly by the quantity of wine that is employed in such a dose.

The other vegetable acid, which, applied to antimony, may afford the emetic in question, is that which is found in the crystals of tartar. This, applied with a large proportion of water to one of the most active preparations of antimony, is found to dissolve a considerable quantity of the reguline matter, and, by a proper evaporation, to give the noted Tartarum Emeticum. The London College, on this occasion, employs the *crocus metallorum*; whilst the former editions of the Edinburgh Dispensatory employed the *vitrum antimonii*: but little difference was found to result from this difference of the subject. With respect to both, it was alleged, and I believe justly, that from some difference in the encheiresis, the medicine came out of unequal strength; and that it was difficult, in the hands of different chemists and apothecaries, to bring it to a standard, which is however much to be desired. On this account the Edinburgh College have given a new prescription, which they think may serve to give a more steady and uniform preparation: and I am persuaded that, when properly executed, it will do so. But our apothecaries have not yet complied with the prescription, so as to give me an opportunity to judge of it from experience.

The emetic tartar, as commonly prepared, is a safe, and, under any proper management, a sufficiently effectual preparation for every purpose of emetics that we have mentioned above: and after a few trials of any new made preparation, we can ascertain the dose of it pretty exactly.

There remains, therefore, on this subject, one question to be considered; and that is, as we have referred the whole of the preparations to two heads; the one, of those in which the antimony, without being combined with any acid before it be thrown into the stomach, is only put in a condition in which it may be acted upon by the acid which it meets with there; and the other, of those in which the regulus is previously combined with an acid before it be thrown into the stomach; the question is, whether the one set of these preparations have any advantage over the other? I am clearly of opinion, that the former have no advantage over the latter: and though there may be many instances

of the good effect of the former, the uncertainty of its dose would make me prefer the latter, in which the dose may be pretty exactly ascertained. And I can speak of it from much observation, that the uncertainty of the dose of the former has often given occasion to the timid practitioner to be disappointed, and to the hardy to do much mischief.

CHAPTER XX.

CATHARTICA.

THESE are medicines which evacuate the intestines downwards; or, as the common language is, promote and excite the evacuation by stool, and which, when any way copious, we shall name a purging.

This evacuation must always be produced by increasing the peristaltic motion of the intestines downwards: and there are various states of the system, which, without the application of any medicine, may occasion this; such as obstructed perspiration, cold applied to the lower extremities, and some other circumstances which are not to be further taken notice of here, where we are only to consider the evacuation mentioned, as produced by the application of certain substances directly to the intestines themselves: and these are strictly the cathartics to be treated of here.

Of these, the first thing to be observed, and which has always been observed, is, that the medicines employed are of different degrees of force or power in producing the evacuation: and it is to be desired, that in this respect they could be assorted into different classes, and that it could be determined upon what grounds besides that of an inaccurate and unequal experience they might be arranged under the two titles of Mitiora and Acriora. It may be difficult to do this with any precision: but I think it worth while to attempt it.

To this purpose I conceive, that there are substances which are only capable of stimulating the extremities of the exhalant vessels, or the excretories of the mucous follicles; by both which irritations, a large quantity of fluids may be drawn into the cavity of the intestines, and thereby a copious evacuation by stool be produced, without much increase of the peristaltic motion.

Although I have put this supposition, I cannot certainly determine that there are any medicines which thus act upon the excretories without stimulating the muscular fibres of the intestines. And I believe it is most safe to suppose, that every medicine which increases the evacuation by stool, acts more or less by stimulating the moving fibres of the intestines; and, by increasing the peristaltic motion, produces the evacuation.

This being therefore supposed, I would, however, enquire, if there is not a difference in the nature of the stimulus given by

different cathartics : and I am persuaded that such a difference may be perceived. In Glauber's salt, for example, a stimulus is applied to the moving fibres of the intestines : but it does not seem to be capable of exciting inflammation in the coats or fibres of the intestines, nor of exciting heat in any other part of the system. Whereas in jalap we know that there is an acrid resin, which, applied in a certain manner, inflames the intestines, and excites a considerable degree of heat in the rest of the system. These two substances I take for examples of the assortment that may be made of cathartics, and the grounds on which I have proceeded in arranging them under the two heads of Mitiora and Acriora, or under those of a cooling or of an inflammatory kind. I have not, indeed, in this respect, under the first title in my Catalogue, been sufficiently correct : and I find it difficult to be so. But I shall endeavour afterwards to mark what corrections it may be proper to make.

In the mean time, I would fix, as well as I can, to the first set, the term of Laxatives, and to the other the term of Purgatives; intending by these appellations not to express the degree of power as has been usual, but the manner of their operating.

Having thus endeavoured to give an idea of cathartics in general, before proceeding to particulars I shall endeavour to consider their more general effects.

The first effect of them to be taken notice of, is the very general one of their promoting the evacuation of the contents of the intestines for the time present in them; which may be especially necessary when any unusual, noxious, and acrid matters are a part of these.

The next circumstance in the operation of cathartics, to be taken notice of, is, that it extends to the whole length of the alimentary canal, from the upper orifice of the stomach to the lower extremity of the rectum. There may be substances which are particularly suited to promote the evacuation of the stomach downwards; but we are uncertain of this. And we mean here to observe, that the operation of cathartics, though only and directly on the intestinal canal, serves to evacuate the stomach; and therefore, that cathartics are so often useful in many of the disorders of this important organ.

In the next place, we are to consider more strictly the operation of cathartics upon the intestinal canal, and the effects of this upon the intestines themselves : and these are, in the first place, to promote the peristaltic motion when preternaturally slow or obstructed.

The slowness of the peristaltic motion seems to be often in fault : but it is not easy, in different cases and persons, to say when it is preternaturally so. The frequency of stools is very different in different persons; and it is not determined what is natural and most healthy in this respect. What seems to be most probable is, that in every person a stool should occur once in the course of eve-

ry twenty-four hours; and we believe that this is truly the most frequent case. But there are so many instances of longer intervals without any inconvenience, that it is very doubtful if, with respect to different persons, this could be established as a general rule. I am however, clearly of opinion, that every considerable deviation from a diurnal stool may be considered, as an approach to an unnatural state.

In this business, however, it is to be observed, that, besides the delay of stools, there is another circumstance to be taken notice of; which is, that whenever stools are delayed, it is probable that there is especially a slowness in the action of the great guts, by which a larger proportion of fæces is accumulated there, which acquire also a greater degree of firmness and hardness; whence they are often voided with difficulty and pain, and thereby give occasion to many disorders in the lower intestines, and even in the whole system. This is what we name a state of costiveness, and which generally depends upon the slowness of the peristaltic motion, and upon what is the consequence of this, the increased bulk and hardness of the fæces.

This state generally indicates the use of carthartics of one kind or other; and in order to be guided in the conduct of these, we judge it to be proper here to enquire more particularly into the causes of this state. The first we would assign is the weakness of the peristaltic motion: and accordingly it is observed that a slow belly is often attended with other marks of that weakness; and on that account occurs very frequently in the female sex, who are often of a slow belly, and suffer many inconveniences from it.

Another cause of a costive habit is of a contrary kind, and depending upon the vigour and rigidity of the alimentary canal. In this state, as some degree of torpor always attends strength, so the contents of the intestines are moved more slowly onwards; but at the same time the concoction, if I may use the expression, of the aliments, is more completely performed, and probably a smaller proportion of fæces is produced. At the same time also, as the absorption of the more liquid parts is more completely performed, a smaller proportion of fæces are deposited in the great guts, and that also in a drier state: from both of which circumstances we may understand, why, in rigid and robust persons, a costiveness so commonly takes place.

Nearly the same case with this, seems to be that of hypochondriac or melancholic persons; in whom, with rigid viscera, there is a preternatural torpor in the motions of the whole system, and particularly in the intestinal canal.

Upon this subject, we judge it proper to mention some other causes of costiveness. One of which may be a deficiency of bile, which we suppose to be a chief means of supporting the motion of the intestines downwards. We cannot, indeed, always perceive when this occurs; but that it may occur, we presume from the case of a jaundice, which is commonly attended with a slow belly.

Although we cannot always perceive the deficiency of bile, or of pancreatic liquor, to be the cause of costiveness, we can with probability as a cause of it, assign the abstraction of the other intestinal fluids. This we suppose must necessarily happen from an increased perspiration, which I have more frequently observed from any very constant mode of gestation than from bodily exercise; and it is in this manner that I would account for the effects of the constant gestation in sailing in producing costiveness, which so generally happens to persons at sea.

To the causes of costiveness arising from the state of the system, I have but one other to add; and that is, any considerable compression of the intestines which I have had occasion to observe from a steatomatous tumour of the omentum, and which also happens so frequently from the compression of the uterus in pregnant women.

We have now mentioned the several causes of peternatural slowness in the motion of the intestines which may indicate the use of cathartics: and I have also said they are indicated when the passage of the contents is entirely interrupted. It is well known that this happens when any portion of the intestines is affected with a spasmodic and a somewhat permanent constriction. As this is commonly attended with pain, it gives the disease named Colic: and this, with some other obstructions which we cannot clearly ascertain, require the use of cathartics; but without entering into the nature of these particular ailments, which cannot properly be done here, I cannot say more on the subject in this place.

After mentioning these operations of cathartics upon the intestines themselves, we proceed to mention the effects of their operation upon the other parts of the system.

The first of these to be mentioned is the evacuation and diminution of the fluids that take place with respect to the whole system. The great length of the intestinal canal, holding generally in its cavity a quantity of liquid matter, and therefore this alone when carried out more suddenly by the operation of cathartics, may often afford a large evacuation. But when it may be presumed that the cathartics at the same time excite all the excretions by which liquids are commonly poured into the intestines, as bile, pancreatic juice, ordinary exhalation, and the effusion of mucus ready to be poured out, it will be evident that cathartics even by a moderate stimulus applied, may occasion a very large evacuation and diminution of the fluids of the body; and this more considerably as the stimulus applied to the moving fibres of the intestines is stronger.

Consequently it is obvious, that the evacuation by stool may be so large as to diminish the quantity of fluids in the whole system; and therefore, that whenever such a diminution is indicated, it may be obtained by the use of such medicines. And I need not say that particularly by this means any preternatural increase of

the activity, or of the active powers of the system, may be thus greatly diminished.

It is at the same time, however, to be remarked, that although by purging a great debility of the system may be induced, it may not produce any great evacuation of the sanguiferous system. A large evacuation by stool may sometimes be merely of the contents for the time present in the intestines, and therefore not drawn from the blood-vessels: and though the evacuation may be still larger by what is drawn from the mucous follicles, this we know may be very copious from the matter contained in the follicles themselves, without much liquid being drawn from the blood-vessels. The evacuation, indeed, may also be increased by what is drawn from the arteries by the exhalent vessels: but as this must be drawn off slowly in very divided portions, it can have little effect, and at least no sudden effect in the depletion of the sanguiferous system: and from the whole it will appear, that the evacuation by stool may be very large, without much effect in taking off the tension and tone of the blood-vessels. In this respect, indeed, it seems to fall far short of the powers of blood-letting, though this is contrary to the common opinion, and even contrary to the practice of *Sydenham*: but accordingly we have not found purging to be of very great effect in taking off the phlogistic diathesis of the system.

Beside the general evacuation of the whole system, purging is powerful in changing the distribution of the blood into the several parts of it.

The circumstances, according to which the distribution of the blood is made into the several parts of the system, we suppose to be commonly known; and to this effect, that if an evacuation is made from one set of vessels, the afflux of fluids will be increased in these, and that the afflux into other parts of the system will at the same time be diminished. Upon this principle it will be readily understood, that if the afflux of fluids in the descending aorta be increased, as it must be by purging, the afflux must in some proportion be diminished in those vessels which carry the blood to the head. By this the quantity and impetus of the blood in the vessels of the head must be diminished by purging: and hence it is, that this operation of cathartics has been often found so useful in the diseases of the head.

It has been commonly supposed that purging, by drawing from the superior parts, may be of use also in the diseases of the thorax: and in several circumstances it may possibly be so. But practitioners have frequently observed, that in the inflammatory diseases of the lungs, purging has not been so useful as might be expected. It is probably owing to this, that by emptying the system of the descending aorta, no considerable derivation can be made from the bronchial arteries, in the extremities of which the inflammations of the lungs are seated.

Many circumstances show that there is a balance in the distri-

bution of the blood between the external and internal parts, so that they mutually increase or diminish one another. We have shown above that the increase of perspiration abstracts the fluids that should be poured into the intestines: and it has been frequently observed, that an obstructed perspiration has occasioned a diarrhœa. If this change of distribution, therefore, is in general the nature of the œconomy, it will be readily understood, why purging, by increasing the afflux of blood to the internal, should diminish that to the external parts, or to the surface of the body, and that it should therefore have considerable effects in many cutaneous diseases.—Whenever these depend upon any inflammatory determination to the surface of the body, purging may be a remedy for them: and when it is foreseen that in certain diseases such an inflammatory determination to the skin is to arise, and according to its violence to aggravate the disease, it will be evident that purging, by moderating or taking off that determination, may render the disease more moderate. This I take to be the foundation of the practice of purging in the approach and beginning of the small-pox: and I have no doubt that this, in concurrence with other measures, contributes to the mildness of the disease.

Purging, therefore, may be of use in cutaneous affections: and physicians have very universally employed this remedy in those cases, but often very improperly; as they have not attended to this, that cutaneous affections are often purely topical, and unconnected with any general state of the system, and therefore not to be cured by remedies chiefly affecting this.—And upon this occasion I cannot help taking notice that physicians have considered purging too much as a means of evacuating acrimony diffused over the whole system: and as cutaneous eruptions were commonly considered as a mark of this, so, upon a doubly false principle, cathartics have been more frequently employed in these affections than they ought to have been.

There is still another effect of cathartics and of purging to be mentioned. As in every cavity of the body there is an exhalation and inhalation, or absorption, constantly going on, it is presumed that there is some balance constantly preserved between the secretory and absorbent powers; so that if the former be increased, the latter will be so also: and therefore, that when the secretions are upon occasion much increased, the action of the absorbents may be particularly excited.—This explains why purging often excites the action of the absorbents, to take up more copiously the fluids that were otherwise stagnant in the adipose membrane or other cavities of the body; and thereby often proves a cure of dropsy.

These are the different and ordinary effects of cathartics: and they are commonly the effects of them as taken in by the mouth. But, before going further, it is proper to observe that there are

two other ways in which they are applied. The one is, by applying or anointing them on the teguments of the lower belly; and the other is, by applying them to the *intestinum rectum* either by injecting them in a liquid form into the cavity, or by applying them in a solid form to the extremity of that intestine.

The first of these practices has been formerly employed, and, for aught I know, may, upon certain occasions, be again tried: but the uncertainty of the dose has made me doubt of its propriety, and prevented my ever trying it.

The second means, or the use of glysters, is often a necessary, and very often an useful, practice: and the medicines most proper to be employed in it shall be mentioned hereafter, as shall also those fit for suppositories; though I hold these to be seldom either very necessary or very useful.

PARTICULAR CATHARTICS.

MITIORA.

I have begun with these, which I consider as strictly the *Laxantia*, making, in the sense I have explained above (that is, in their manner of operating,) one class of Cathartics. Of particulars I have set down first the

FRUCTUS ACIDO DULCIS RECENTIS.

As all of these contain a quantity of sugar, and some of them in large proportion, it may be a question, whether their laxative quality may not be entirely ascribed to this. And it is not obvious that the acid joined can contribute to that quality. But it seems to appear from experience, that those fruits, which have an acid joined to their sugar, are truly more laxative than the more simple sweets.

The reason of this effect of acidity is not very evident: but it may perhaps be explained in this manner. We know that the aliments, as they pass out of the stomach, are commonly more or less acid; but by being mixed with the bile in the duodenum, have this acidity corrected or involved, so as hardly to appear afterwards in the other parts of the system: and accordingly large quantities of acid may be sometimes taken into the body, without shewing any laxative effects. But there are considerations which lead us to believe, that the power of the bile in correcting acidity, has its limits, and to judge, at the same time, that an over proportion of acidity, joined with the bile, forms a mixture that is considerably laxative.

This renders it doubtful whether the laxative effects of our summer fruits are to be ascribed to the simple combination of acid and sweet: or if always to a mixture of bile with an over proportion of acid, either as taken in, or as acquired by fermentation in the stomach. We find it difficult to judge in this matter; but find it may commonly be done by the proportion in which the acid prevails in the aliment taken in, by the quantity of this taken in, and especially by the state of the stomach, known from other circumstances to be more or less disposed to an acescent fermentation.

After this general discussion, we may speak more clearly of particulars.

The first mentioned are the *Fructus recentes*. These may be considered as constantly laxative. But they are alimentary matters, frequently taken in without shewing any laxative effects: and though in costive habits they may be advised to be taken in more largely as aliments, they are hardly ever to be prescribed as medicines; because the larger quantity in that case to be prescribed will always be of uncertain effect, and may as readily produce a diarrhoea as prove a proper cure of costiveness.

After this general observation, I need not speak of the several species; as the choice of these, so far as they can be employed in the case mentioned, may be learned from what was said of them above when treated of as aliments.

After the *Fructus recentes*, I have set down the *Fructus siccatae*. These also are certainly laxative, though not so much as the *recentes*; but they are employed with more safety, as deprived of their air. They are for the most part less acescent, and therefore less liable to have their acidity in excess. But at the same time, it is to be observed, that those fruits which have more acid in their composition, are more laxative than those more purely sweet: and it is on this account that dried prunes are constantly preferred to raisins.

With regard to all the dried fruits it is to be remarked, that they are more powerful when they have been boiled or otherwise exposed to a considerable heat, than when taken in their raw state; probably for this reason, that being heated, much of their air is exhaled, so that they are less liable to any excess of fermentation.

After the *fructus acido dulces*, I have set down the

CASSIA FISTULARIS.

This, in my opinion, is very much of the same nature with the fruits mentioned: and I must say further, that I have not found much advantage in the use of it; and I believe that other practitioners observing the same, has occasioned its being now less used than formerly. It is now, indeed, hardly ever employed by itself, and almost only as entering into some official compositions, in which, however, we have not perceived its peculiar utility. We have particularly tried it with manna; but never found the effects of it to be such as *Valisnieri* alleges. It would certainly be proper for our country apothecaries to know that the pulp of prunes might be employed in the place of the more expensive and precarious cassia.

TAMARINDUS.

This is a fruit containing with its sugar a large proportion of acid, which renders it fit for every purpose for which the *fructus acido dulces* can be employed. It is particularly laxative, though not in a strong degree: and it is most useful when joined with those of the sweeter kind. The acidity of the tamarind renders these more agreeable: and both together are employed with more,

safety than the cassia or fructus acido dulces, as the tamarind contains an acid of the nature of tartar, that renders it less liable to fermentation. And we have always found, that in our compositions of Diacassia, Lenitivum, and Infusio Tamarindorum, the tamarinds may be employed more largely than they have commonly been.

The tamarinds are commonly imported into this country as they have been taken out of their pods in the West-Indies : and there is commonly added to them there a quantity of sugar, which very much changes their state, and destroys the purpose of their acidity. It would certainly be very proper to have them always imported in the pods.

After these acido dulces, I have set down what I think akin to them, that is the Lac ebutyratum, as containing a sweet and an acid combined ; by which it is certainly laxative, though not very strongly, except when taken pretty largely.

We cannot so strictly put here the recent Serum lactis, which might be more properly put with the Dulcia ; as its ordinary laxative effect may be ascribed especially to the sugar it contains. As this sugar, however, or something else that milk contains, is so quickly acescent, they may be considered as becoming readily so in the stomach ; and therefore that its laxative qualities may be supposed to depend upon its being an acido dulcis. The flatulency which so commonly attends its operation, and the previous boiling diminishing its laxative quality, are probable grounds of supposing it to act in consequence of fermentation.

Here I was disposed to set down in my Catalogue fermented liquors of all kinds, as I think they may all be considered as res acido dulces : and, in my opinion, were it not for the large proportion of alcohol that is sometimes present in them, they would all show a laxative power. Accordingly, in the view of their being laxatives, they are sometimes ordered more largely in diet : but with respect to them, there is an idiosyncrasy of particular persons that regulates this matter, insomuch that the same wine proves astringent to one person and laxative to another. With respect to wines, therefore, this idiosyncrasy is always to be consulted. But I have hardly ever found it necessary with respect to malt-liquors, which I judge to be in all persons, upon the grounds above mentioned, more or less laxative.

After the res acido dulces, I have set down the more simple sweets of sugar and honey ; which I maintain to be properly marked as laxatives : but all that was necessary to be said of them in that view has been said already above, under the title of the Attenuantia Dulcia. And I now proceed to a subject that every one supposes to belong to the title of Laxantia.

MANNA.

This is a part of the sugar so universally present in vegetables, and which exudes on the surface of a great number of them.

When it exudes in a dry form, it is named Manna.—In this form it appears on the surface of a great number of different vegetables: but how far, as proceeding from different vegetables, it is different in its qualities, does not seem to me to be clearly ascertained. We are of opinion they are very little, if at all, different.

But however that may be, I can properly speak only of that species employed in the practice of Britain, which is the manna exuding from, and concreting on the surface of the *Fraxinus ornus*. The difference of this, as occurring from the season, manner, and circumstances in which it is collected, we must leave to writers on natural history and the materia medica, who have taken some pains on this subject: but as not having the opportunity of certain and exact information, I must avoid it: and I must, to speak of its medicinal qualities, be satisfied with taking for the subject of my observations the purest kind I am acquainted with.

Manna then, in its sensible qualities, does not differ from sugar: at least I cannot discover any peculiar taste or acrimony that can mark any difference, and only some unctuousity and mildness that is somewhat more than in refined sugar.

Nor does manna, in its chemical qualities, differ but in the slightest degree from sugar: and therefore, if manna has any peculiar and medicinal qualities, we have not yet discovered, in the constitution of it, upon what these depend. This would lead to suppose, that they are not considerably different from those of sugar: and we are much disposed to think that this is the real state of the case. We dare not indeed deny the laxative powers of manna: but in employing it by itself we could never perceive them to be considerable, and it is not easy to estimate its power in compounds. We have indeed seldom tried it singly; but even when we did in children, we have been often disappointed. Though the laxative powers of manna are not considerable, I believe them to be such to a certain degree; as, in the most frequent employment of them along with neutral salts, I have thought that the manna employed supplied the dose that might otherwise have been required of the neutral.

After the *Dulcia*, I have set down the *Radices dulces*, as those of the skirret, beet, carrot, &c. as manifestly containing a quantity of saccharine matter rendering them laxative. After these I have put the *olera blanda*, the chief of which is the brassica, containing a considerable quantity of saccharine matter disposed to an acescent fermentation: and though not so remarkable for these qualities, I would also mark here the leaves of the beet and spinage. All these, though employed in diet only, as they may be prescribed in larger quantity than usual, as laxatives, I thought it proper to fill up my list with every thing that might belong to this title.

LAXANTIA SALINA.

These are the chief of the laxantia mitiora: and they differ both from the saccharine laxatives we have hitherto treated of, and from the purgatives we are to treat of hereafter; being more powerful than the former, but milder than the latter. The difference in comparing them, we have endeavoured above to point out and explain; and do not think it necessary to repeat here any account of the difference of stimulus given to the intestines by the one or the other: and therefore, supposing this explanation understood, I proceed to consider particulars.

The first I consider is the fixed alkaline salt. The two species of this are, I believe, nearly of the same nature. But that intitled the Vegetable having been especially the subject of my observation, what I am to say on fixed alkali will especially relate to that.

This comes out somewhat different, from some difference in the manufacture of it: but I am not to take any notice of these differences; and must be supposed to speak always of the *sal tartari*, or of the *sal alkalinus fixus vegetabilis purificatus* of our Edinburgh Dispensatory. This salt, as it is in chemistry, so in medicine it might be considered as a substance very different from the neutral salts. But its operation in the human body is not so much different as might be imagined; for it can hardly be thrown into a human stomach without meeting there with as much acid as will convert it into a neutral; so that its operation afterwards must be the same with that of a neutral. From this view of the matter, I am uncertain how far the operation of the fixed alkali in the stomach may be that of a simple alkali, or how far it may be that of a neutral: and therefore we must be uncertain how far the virtues ascribed to it by writers are to be considered as the effects of the one or of the other. As an alkali, it must in the first place act as an absorbent, but its proving such converts it into a neutral; so that its laxative and diuretic effects may entirely depend upon its being in this state. Its laxative powers have been commended; but I have never found them to be considerable; and I should never think of exhibiting them with this intention.

The diuretic effects of the fixed alkali we have frequently experienced: and if we have been also very frequently disappointed in this, we are not ready to conclude a want of power in the medicine. There is a great uncertainty in determining to the kidneys; and from this we are often disappointed in the effects of powerful diuretics. With respect to the fixed alkali, I must observe, as I have often done in practice, that I have never found it powerfully diuretic but when it is thrown in in large quantities.

On this subject of the fixed alkali, besides its laxative and diuretic powers, there is another ascribed to it, which I think it necessary to take notice of; and that is, its power of dissolving the fluids, or the concretions which may happen to be formed in

them which the French writers express by the term of *Fondant*. Either for the supposing of this power, or of its effects, I can find no foundation. I will not deny its having some power in this way; but, as I observed above, this in the mild alkali is very small; and though, in its caustic state, it may be sufficiently powerful, this, in any quantity that can be introduced into the body, cannot possibly have any effect upon the quantity of fluids to which it is applied, and especially when it is considered how much of it must be withdrawn by the acids of the stomach. How much, therefore, whether good or bad, may have been said of the solvent power of alkalines in the mass of blood, we hold it to be truly none at all.

After the fixed alkali, I am to speak of the incomplete neutral.

TARTAR.

This, in its rude state, may perhaps be employed: but we are acquainted with it only in its refined state, when it is named the *Crystals*, or *Cream of Tartar*.

This consists, for a great part, of the vegetable fixed alkali, supersaturated with a quantity of an acid which, though in the main, of the nature of the vegetable acid, has however something peculiar, which to me is not well ascertained: but in the mean time, the consideration of it does not seem necessary in any application of it to the purposes of medicine.

This subject, the crystals of tartar, has long been employed as a laxative and gentle cathartic, and may be given from one drachm to two ounces, according to the constitution of the person to whom it is given, and to the operation intended by it. Under half an ounce, it is commonly a laxative only of moderate power; but given to an ounce or upwards, it often acts as a powerful purgative.

Taken in a moderate dose, in evacuating the intestines, and in producing all the effects of that, it has all the powers of the neutral salts, and is as useful an antiphlogistic as any we can employ. In large doses, however, without any inflammatory stimulus applied to the intestines, it acts like a purgative in exciting the action of the absorbents in every part of the system, and that more powerfully than happens from the operation of any entirely neutral salt. I need hardly say, that upon this operation of exciting the absorbents, is chiefly founded the late frequent use of the crystals of tartar in the cure of dropsy.

When the crystals of tartar are thrown into the body in such quantities as to operate little by stool, they pass more readily into the blood-vessels; and even when thrown into the stomach more largely, they sometimes take the same course. In both cases they pass to the urinary passages, and promote the secretion of urine sometimes very copiously. I have, however, been frequently disappointed of their diuretic effects: and it is proper to be remarked by practitioners, that they do not readily take their course to the kidneys, unless they are accompanied by a quantity of water, or

watery fluid, thrown in at the same time: and therefore, as *Dr. Home* has taught us, they are most properly given in a liquid form.

SALES NEUTRI.

These are the laxatives or gentle cathartics most generally employed. As they do all that can be effected by any evacuation from the intestines, without acting strongly upon the moving fibres, they give no stimulus, or at least no inflammatory stimulus, to the whole system; and are therefore most usefully employed when any phlogistic diathesis prevails in it.

The whole of the neutral salts may be employed for these purposes, but some of them more conveniently than the others.

That formed of the fixed acid of vitriol with the vegetable fixed alkali, from its being of difficult solution, is not a convenient medicine: but if the neutral be formed of the sulphureous, or volatile vitriolic acid, when it comes under the title of *Sal Polychrestus*, this, to persons who can bear its odour, taken from one drachm to four, proves a very convenient laxative. But I must remark here, that those apothecaries mistake the matter much, who take the residuum of the distillation of *Glauber's* acid of nitre for the *sal polychrestus*.

The vitriolic acid with the fossil alkali, gives the neutral named *Glauber's Salt*, in very frequent use; and which, indeed, on every occasion, serves the purpose of the neutrals.

It is now well known, that such a neutral may be made of the vitriolic acid with either the fossil alkali or with *magnesia alba*: and from every observation I can make, there seems to be no difference in the two compositions for all the purposes of a neutral salt.

The nitrous acid with either of the alkalines gives laxative neutrals. But they are not conveniently employed in practice, because the quantity that is necessary to be a laxative dose is commonly very disagreeable to the stomach.

The muriatic acid gives neutrals which may be employed when largely diluted. But to most persons the salt taste is disagreeable: and large doses are ready to excite an uneasy thirst, that continues after the operation of the salt is over.

The vegetable acids, either native or fermented, give neutrals that may be employed; but they are not very powerful, and therefore seldom conveniently used as laxatives.

It is the acid of tartar that gives some of the most convenient laxatives: and they are prepared by saturating the crystals with the quantity of alkali necessary to render the whole exactly neutral. For this purpose, either the fixed vegetable or fossil alkali may be employed. The former gives the *tartarum solubile*, or *alkali tartarisatum*; and the latter gives the *sal Rupellensis*, or *nitrum tartarisatum*. The *tartarum solubile* is not easily brought into a crystalline state, or kept in a dry form; whilst the *sal Rupellensis* has not either of these disadvantages. It is of a less

disagreeable taste than almost any other neutral; and as answering every purpose for which these can be required, I expect it will come to be very generally employed. As the acid of tartar is of a weaker attraction than almost any other acid, so it may be often dislodged by the acid of the stomach: and this often renders the operation of the tartarum solubile less certain, as the combination of the alkali with the acid of the stomach is a less powerful laxative. But the *sal rupellensis* is not liable to this disadvantage; as the acid of the stomach combined with the fossil alkali is still a tolerably powerful laxative.

Under this title of the neutral laxatives, it is proper to mention the *magnesia alba*, which I have inserted in my catalogue. It is an earthy substance, of itself inert; but meeting with acids in the stomach has the same operation with neutrals. It is not necessary to say any thing here of its preparation or administration, as both are now commonly well understood.

After the neutrals, I have set down the saline mineral waters, which are certainly to be reckoned amongst the laxantia, and are indeed often employed as such with all the effects of the artificial neutrals. To render my work complete, I should have treated of these mineral waters. But neither my leisure, nor the size to which my work must be confined, could admit of such a treatise: and it did not seem necessary, as there are some very good works on the subject in every body's hands. I must not however dismiss the subject without one observation.—Many mineral waters have more effect as laxatives than might be expected from the quantity of saline matter they contain; which shows, that a quantity of water accompanying these salts, contributes to their operation; which leads to this lesson, that the artificial neutral salts may have their powers and effects always improved by being exhibited with a large quantity of water.

I have now mentioned the several substances, which, by the degree of force they commonly exert, as well as by the nature of their operation, are entitled strictly to the appellation of Laxatives: and I might now proceed to consider those substances which may be as strictly named the purgatives. But I have set down in my catalogue several substances that will not properly arrange under either article, or such as I am uncertain whether to refer to the one or to the other, but which must not be kept entirely out of the sight of the practitioner.

Of these, which by the force they exert may be considered as laxatives, though their manner of operating be very different, I would mention the *olea blanda*, whether obtained by expression from vegetables, or in the form of butter from the milk of animals.

These, I have said, enter into the composition of the chyle and animal fluids: but this happens when taken in to a certain quantity only; for if that is greater than can be properly united with the other fluids, a part of such oil must remain and pass along the

intestines in its separate state. In this state it appears, from experience, that it contributes to promote the evacuation by stool. How it does this, I am not ready to explain; but its doing so was enough for me to give these oils a place in my catalogue. I knew a person who frequently required a laxative; and the laxative commonly employed was from half an ounce to an ounce of the pulp of cassia, with an ounce of the oil of sweet almonds: but on several occasions, it was found that the pulp would not answer the purpose without the oils being at the same time employed. In another instance, I have had occasion to observe the laxative powers of oily matters. A person was advised to take as a medicine, every morning, four ounces of fresh butter; and the effect was constantly to give a stool or two more than usual.

After these oily matters, I choose to mention what has some affinity with these, the *sapo albus hispanus*, or the purer kinds of white soap.

This I have set down in my catalogue in complaisance to the general opinion; but, in my own, its power is never considerable; and when it does appear, it is upon a ground that practitioners do not commonly apprehend. I have had many instances of persons taking this soap to half an ounce or more every day without its shewing laxative effects: and though it does upon many occasions show these, it may, I think, be a question, by what quality it operates? If the purest soap be dissolved, as it may readily be in rectified spirit of wine, the salt commonly intermixed with the soap is left undissolved, and the dissolved soap, by a proper evaporation, may be recovered in a dry form.

In this state the soap is mild and insipid; and in my opinion cannot give any irritation to the intestines, or to any other the most sensible part of the body.

We presume, therefore, that soap is not a laxative, and if ever it appears to be so, this I think must be ascribed to the common salt, which, from the circumstances of the manufacture, it always contains: I formerly gave a stricture with respect to the use of soap in glysters, and I have now another observation to offer. If soap, upon any occasion, come to be employed in nephralgic cases, and by proving laxative, should thereby limit the use of it more than might be desired, the correction will be easy. The soap, by the process above mentioned, may be deprived of its common salt, and still remain as fit for the cure of the nephralgia as ever, and more useful perhaps, as it may then be taken in much larger quantity than before.

Two other substances yet remain to be mentioned as laxatives; which, by their degree of power, will from every body obtain that appellation, though their manner of operating may be different.

SULPHUR.

I am not here to attempt the chemical history of this substance; because I can hardly make application of its various chemical

treatment to the purposes of medicine. Many of the preparations of sulphur promise to be active with respect to the human body, and they undoubtedly are so; but the virtues that have been ascribed to them seem to me to be very uncertain; and I have not been able, either from experience or reflection, to ascertain their proper use: and in the meantime, I consider all powerful stimulants, that are not directed by a nice and scientific choice, to be in the hands of the most part of practitioners more frequently mischievous than useful. I do not judge myself skilful enough to direct in this matter, and therefore avoid the subject; and I have introduced the title of sulphur here to consider it merely as a laxative. In this view, from half a drachm to a drachm of the flores sulphuris will seldom fail to give one stool, and will seldom give more. It has this operation without heating the body, and for the most part without griping the bowels. These circumstances render it a most proper and convenient laxative; and were it not for the fætor that sometimes attends its operation and is ready to be diffused in the air around, sulphur would be one of the most agreeable laxatives that could be employed. As sulphur is not obviously soluble in the animal fluid, there is some difficulty in accounting for its operation; but however we may account for it, this is certain, that a laxative quality is in some measure extracted from it: and I would make this use of its being slowly dissolved to allege, that it passes through a great length of the intestines with little action upon them, and at length acts only upon the great guts. This explains to me both its moderate operation and its particular and frequently observed effect in relieving hæmorrhoidal affections.

SINAPI ALBUM *vel* NIGRUM.

Though I have touched this subject before, to give it more fully and clearly I must repeat a little.

This seed is employed as a laxative in a peculiar manner. In its powdered state it has laxative qualities; but it cannot be employed in the quality necessary as a laxative without irritating the stomach very much, and even occasioning vomiting. It cannot therefore, in powder, be employed as a laxative, but by taking the seed in its entire and unbruised state: and by swallowing it in this state to a certain quantity, it seldom fails to prove laxative. Generally a table-spoonful, or about half an ounce in weight is the dose which, taken once a day, keeps the belly regular, that is, produces one natural stool every day. Sometimes, however, this is not enough; and for the purpose, the dose must either be increased, or that mentioned must be taken twice a day.

With respect to this, it has been apprehended that the seed taken, might be broken down in the stomach, and therefore, in large quantity prove a dangerous dose; but I believe there is no ground for this, as I am persuaded that the seed is never broken down in the stomach, and I have known it to appear entire in the stools. I once knew a paralytic woman, into whom more than

four ounces of mustard seed had been successively thrown, without any evacuation by stool having happened in the mean time. This, however, was afterwards produced, when the mustard seed came away seemingly in the same quantity, and in the same entire state in which it had been taken in.

Though from these accounts it appears that this seed is not broken down or dissolved in the stomach, yet, from other circumstances it is certain, that in the stomach or intestines it gives out some portion of its substance. That it gives a stimulus to the system appears clearly from *Bergius* finding it to be useful in intermittent fevers. It is commonly alleged, by our practitioners, to be useful in palsy and chronic rheumatism; and its operation in the urinary passages is commonly evident by its promoting the secretion of urine.

Two other substances are set down under the title of Cathartica Mitiora; but whether to be considered as laxantia stricte dicta, we dare not determine.

AMARA.

The effect of these as laxatives, and even as purgatives, interrupting the use of them in the cure of intermittent fevers, we have taken notice of above; but it seems still proper to insert them in our list of cathartics here.

They are seldom employed for this purpose alone; but I have known a strong infusion of chamomile, or a drachm of the powder employed with success; and I have frequently found that when senna was infused in the infusum amarum, a less quantity of the senna was necessary for a dose than in the simple infusions of it.

Next to the amara I have set down the Bilis Animalium; and the analogy is from several considerations specious; but I must own, that without my being able to perceive the cause of it, I have never found the management that was necessary to render this bile a proper laxative. In its dried state I have given pretty large doses of it without any effect.

BALSAMICA.

Here is an article which I have treated of before; but I still thought it proper to give it the place here which it certainly ought to have among the Cathartica. It does not, however, appear to be necessary to repeat here what my readers can so easily take from the articles of Turpentine, Balsamum, Capiwi, and Guaiacum, relative to the laxative, or if you will, the purgative power of these substances.

II. CATHARTICA ACRIORA, SIVE PURGANTIA.

The distinction of these from the laxantia, not only by their degree of power, but especially by the nature of the stimulus they give to the intestines, I have explained above.

The stimulus of purgatives has been supposed specific with respect to the intestines, and particularly as thus distinguished from

emetics. This, with respect to the specific nature of both emetics and purgatives, has been concluded from this, that these medicines, upon being injected into the blood-vessels of a living animal, have commonly operated by occasioning a vomiting or purging; but this does not imply more than that these organs are liable to be affected by any general disorder of the system; and that it depends upon any specific power in these substances, is contradicted by many other experiments.

It is well known that every emetic, under a certain management, can be rendered a cathartic, and every cathartic of a stronger kind, or in a larger dose, is ready to act as an emetic. If a difference appears in their operation, it seems to me that it is a first application, and a greater solubility, that renders medicines more constantly emetic. That the stimulus of these medicines is not specific, appears clearly from hence, that they are stimulant of every excretory to which they are applied; and we have frequent instances of their acting readily as errhines when applied to the nose.

The stimulus of purgatives has been commonly supposed to reside in their resinous parts; but a comparison of a few particulars will show this to be a mistake.

Before entering upon my Catalogue of the Cathartica acriora, I must observe, that there are two or three articles which I judge to be properly belonging to the order of purgantia, though I have inserted them in the list of the laxantia.

These are the articles of Rosa, Viola, and Polypodium, which by the moderate power of their operation, have been considered as laxatives. But if there is any foundation for the distinction I have established, it will appear that the substances just now mentioned have nothing in their constitution that can lead us to consider them as laxantia stricte dicta. They are certainly of the nature of purgatives, and should have been taken into the list of this order: but as I did not take notice of them in their place, I must now say of them, that their force is so inconsiderable that they do not deserve our attention now, and that they might be entirely neglected in practice.

ALOE.

This is a medicine the most frequently employed, and from the gentleness of its operation, as commonly employed, it might be considered as a laxative; but by the nature of its stimulus, which often appears, it is undoubtedly a purgative.

There are two species of the aloes in use; one named the *Socotorine*; the other commonly named the *Hepatic*, but more properly by the place from whence it is the most frequently imported, *Barbadensis*.

These two species are supposed to be somewhat different in their qualities, and the former generally supposed to be the more excellent. It is certainly a purer substance, of more agreeable flavour, and giving more elegant tinctures; but whether for me-

dicinal use it has any more valuable quality, may, I think be doubted. Both the species are nearly of the same constitution, the proportion of resinous and gummy parts being nearly the same in each; and although there was some difference in these respects, it does not appear to be well determined what difference that would make in the medicinal qualities.

When the London College formerly prescribed the separation of the resin and the gum of aloes, they seem to have thought the virtue of these two parts to be considerably different; but by their omitting this preparation in their last edition, they seem to have changed their mind. I do not indeed know of any experiments which clearly determine this matter; and what is more, I do not know of any decisive experiments which establish the excellency of the Socotorine aloes above that of Barbadoes.

I formerly practised at Glasgow, at the port of which the Barbadoes aloes is chiefly imported, and where, therefore, I had occasion to see it much employed; but I do not remember any instances of its failing of the effects commonly expected from aloetic medicines. By the best information I can get, our apothecaries at present, though they employ the Socotorine for their tinctures, yet whenever aloes is to be employed in a solid form, they constantly employ the Barbadoensis: and I doubt if any practitioner complains of the change that is put upon his prescription. But passing this dispute about the two species, I proceed to mention the effects to be expected from the one or the other, and shall speak of them under the general title of Aloes.

This is chiefly employed merely as a medicine to keep the belly regular; and it hardly ever does more than produce one stool, which seems to be merely an evacuation of what may be supposed to have been present for the time in the great intestines. It is remarkable that it does this in a very small dose. I have known innumerable instances of persons who very constantly obtained this effect for one or two grains of aloes; and it is equally remarkable, that though the dose is increased to ten times the quantity, the effect is much the same. I have found that hardly any dose under twenty grains will procure a liquid stool, and when it happens, it is always with pain and griping; from whence we conclude, that though aloes is more fit than any other laxative or purgative for discharging the present contents of the intestines, it is never a medicine fit for producing any large or liquid evacuation.

With respect to its ordinary operation, *Dr. Lewis* has alleged that its effects are more permanent than those of any other purgative: but this we can hardly admit of; for we commonly find, that notwithstanding the use of aloes, the state of costiveness will return at its usual period, and that it is often necessary to anticipate this by the use of the aloetic.

Upon this subject of the employment of aloes, two reflections are to be made: one is that as aloes does not procure liquid stools,

and discharge only the contents of the great intestines, it is probable, that though, from causes not well understood, it acts hardly upon the smaller intestines, and almost only upon the greater; and which may also be presumed from the slowness of its operation, which is hardly in less than ten or twelve hours after its exhibition.

From this, my second reflection arises, and is, that as aloes operates especially upon the *intestinum rectum*, there may be a foundation for the common opinion of its producing hæmorrhoidal affections; and from the large and frequent use of aloes, I have had instances of such effects: but we must at the same time observe, that from the moderate use, it is not a frequent accident, and does not lead to that nicety which some practitioners express with respect to the use of aloes. I have known instances of its safety even in hæmorrhoidal persons; and I am persuaded that hæmorrhoidal affections are produced by a costive habit, and its circumstances above explained, much more frequently than by the use of aloes.

After mentioning these operations of aloes in the intestines, we would inquire after its operation in the blood-vessels: and it has been a common opinion, that it dissolves or increases the fluidity of the whole mass: and *Dr. Lewis* alleges that this appears in the blood drawn from persons using aloetics. This, however, appears to me improbable. We have frequently seen the blood drawn from persons using a good deal of aloes, and never could discover any change of its consistence: and if we can trust to the experiments of *Schwenke*, aloes, added to the blood drawn out of the veins, seems to coagulate rather than to dissolve it: and whatever may be in this, I would maintain that the quantity of aloes taken in, can hardly have any sensible effect on the whole mass of blood.

The common opinion, however, has prevailed: and it is alleged, that by its dissolving power it proves an emmenagogue, and is hurtful in all morbid hæmorrhagies. Of the latter, however, I have no experience; and must say farther, that I have seldom found the emmenagogue powers of this substance. If ever there be any appearance of such a power, it is probably to be ascribed rather to its operation on the rectum communicating a stimulus to the vessels of the uterus, than to its action on the mass of blood.

On the operation of aloes, I have only further to add, that even when it is not to act as a purgative, it has an action upon the stomach. As it is a bitter, this will be readily admitted; and I have frequently found it to be an antispasmodic, in relieving pains of this organ.

These are the operations of aloes; and I am next to speak of the forms in which it is employed: and my first observation is, that aloes acts as readily in substance as in any solution; and therefore this is never to be practised but for the sake of more con-

venient exhibition: and we have commonly found it operate in substance in a smaller dose than in the *vinum aloeticum*. It is remarkable that aloes hardly receives improvement by any addition, and our vulgar find as much effect from aloes alone as from the *pilulæ aloeticæ*. We are, however of opinion, that some benefit is obtained by some division of the aloes before it is taken into the body; and that the extract of gentian is properly enough employed: but I am persuaded that the Edinburgh College have not done rightly in withdrawing the whole of the *sal polychrestus* from the aloetic pill.

In the *pilulæ rufi*, the myrrh may be useful in dividing the aloes; but we hold the addition of the saffron to be insignificant: and we are certain that though this is added, the *pilulæ rufi*, in the same quantity, never do more than the aloetic pill.

Several practitioners have thought of adding rhubarb to aloes, but to no good purpose that I can perceive. Aloes, as we have said, operates in a very small dose; but rhubarb hardly ever does: and therefore, in the *pilulæ stomachiæ* Ph. Ed. the rhubarb seems to be an useless addition: and I can assert from experience, that these pills never act but in proportion to the aloes they contain, and never more strongly or certainly than the same quantity of aloes taken in the aloetic pill. We are of opinion also that the rhubarb in the *elixir sacrum* is an useless addition; and I know from experience, that a brandy tincture of aloes, to which some aromatic is added, does as much as can be expected or is ever obtained from the *elixir sacrum*.

We are of opinion that the aloes is never properly joined with the drastic purgatives, as is done in the *pilulæ colocynthide cum aloë*, and in the *extractum colocynthides compositum*: for if such a medicine is intended to produce a liquid evacuation, the aloes is superfluous; and if it is intended only to open the belly, the drastics are unnecessary.

The only aloetic I have now to remark upon is the noted *elixir proprietatis*, introduced from a very bad authority: and the first remark I have to offer is, that the saffron is an insignificant ingredient; and another remark to be made is, that upon account of the *menstruum* employed by the Edinburgh College, I have never thought of employing it as an evacuant: but I have employed it often with success in curing spasmodic pains of the stomach: and for suiting it better to this purpose, the Edinburgh College seem to have improved it much, by the *menstruum* they have employed in their *elixir aloes vitriolicum*.

RHABARBARUM.

Much pains have been taken to ascertain the species of this genus that gives the root which the physicians of Britain have considered as the species of greatest value, and such as has been imported under the name of Turkey Rhubarb. Whether this may be exactly determined or not, I cannot clearly judge; and in the mean time, I do not think it necessary to prosecute the matter farther.

with any anxiety, as we have now got the seeds of a plant whose roots, cultivated in this country, show all the properties of what we considered as the most genuine and valuable rhubarb; and which, properly cultivated and dried, will, I believe, in time supersede the importation of any other.

The qualities of this root are that of a gentle purgative; and so gentle that it is often inconvenient, by reason of the bulk of the dose required, which in adults must be from half a drachm to a drachm. When given in a large dose, it will occasion some griping, as other purgatives do: but it is hardly ever heating to the system, or shows the other effects of the more drastic purgatives.

The purgative quality is accompanied with a bitterness, which is often useful in restoring the tone of the stomach when it has been lost; and for the most part its bitterness makes it sit better on the stomach than many other purgatives do. Its operation joins well with that of the neutral laxatives; and both together operate in a lesser dose than either of them would do singly.

Some degree of styplicity is always evident in this medicine; and as this quality acts when that of the purgative has ceased, so in cases of diarrhœa, when any evacuation is proper, rhubarb has been considered as the most proper means to be employed.—I must however remark here, that in many cases of diarrhœa no further evacuation than what is occasioned by the disease is necessary or proper: and therefore the vulgar practice of employing rhubarb in every case of this disease, appears to me to be very injudicious.

The use of it however in many cases of diarrhœa may be proper: but analogy has by a gross mistake transferred it to the case of dysentery, to which its purgative quality is not well suited, as a large and improper dose of it is necessary; and its astringent quality, if it takes place, must certainly be hurtful.

The use of rhubarb in substance, for keeping the belly regular, for which it is frequently employed, is by no means proper; as the astringent quality is ready to undo what the purgative had done. But I have found that the purpose mentioned may be obtained by it, if the rhubarb is chewed in the mouth, and no more is swallowed than what the saliva has dissolved. In that case it appears to me that the astringent quality is not largely extracted, and therefore the cathartic will operate as required: and I must remark, that in this way employed, it is very useful to dyspeptic persons. Analogous to this is the use of rhubarb in solution; in which it appears to me that the astringent quality is not so largely extracted as to operate so powerfully as when the rhubarb was employed in substance.

Water extracts the purgative quality of rhubarb very readily, but does not extract it so powerfully as to allow the dose to come into a small bulk: and therefore the infusion in water is chiefly adapted to the use of children. Wine hardly extracts it more

powerfully ; and both Colleges have given up the use of this menstruum. The only useful solution is that made by brandy, which, if the taste can be reconciled to it, is rendered better by the bitters added in the *tinctura rhei amara*, Ph. Ed. ; but the bitters will hardly make up for the rhubarb being in lesser proportion than the *tinctura rhei dulcis*.

For the use of rhubarb joined with aloes, either in a liquid or in a solid form, I have said enough in the article of aloes : and here, to the young practitioner I would remark, that the dose of rhubarb is for the most part too bulky to come into the form of pills.

The use of rhubarb in the alimentary canal, as a purgative, a bitter, and in some circumstances as an astringent, may be understood from what has been said : and whether its operation in other parts of the system is to be mentioned seems doubtful.

By its colouring the urine, it appears to pass in part by the kidneys ; but I have not perceived it to have any particular effect there : and particularly, though I have often attended to it, I could never find that it promoted in any degree the secretion of urine.

It has been said to operate upon the liver, and to be useful in jaundice ; but I cannot find any foundation for this either in theory or practice ; and I believe the opinion has arisen entirely from the ridiculous doctrine of signatures.

It has been supposed that rhubarb may be a tonic with respect to the whole system, or to particular parts of it ; and accordingly it has been alleged to have been useful in diabetes ; but our experiments here do not at all confirm this.

It has been also represented as useful in the *fluor albus* ; but we have had no experience in confirmation of this, and cannot find it probable that the quantities employed should, either by their tonic or astringent power, be of any service.

POLYGALA SENEKA.

This is a medicine introduced about sixty years ago ; and as a new medicine, was then much commended for its great and singular power : but the esteem of it has since fallen very much. I have put it into the catalogue of purgatives, as this is the only operation of it that is constantly very evident ; and perhaps all its other virtues depend upon this. Some difference is alleged to be between the bark and the woody part of this root, and the latter is alleged to be quite inert. We believe this to be well founded ; but the size of the root, as imported into this country, has not allowed us to attend to this ; and in the smaller twigs we have constantly taken the two parts together.

It has been employed in powder, in a wine infusion, and in decoction in water ; and the last is the most frequently in use. The powder may be given from twenty to forty grains as a purgative. But it is very ready to excite vomiting, and thereby prevent its purgative operation ; which has occasioned the de-

coction to be most frequently used. This is made by boiling an ounce of the root in a pound and a half of water till it is reduced to a pound; and of this a table-spoonful or two is given every hour till it operates by stool: this it commonly does after six or seven doses; producing three, four, or more stools; and this operation is repeated every day, or every second day, till the disease is cured. It frequently, at the same time with its purgative, shows its diuretic effects; and frequently, when large doses can be admitted, it excites a very free sweat.

This medicine was at first introduced as a cure for the bite of the rattle-snake, and by a supposed analogy was proposed as a remedy for pleurisy and peripneumony. It was accordingly for some time very much employed in America; and for its good effects in these diseases, we had from America, France, and other countries, many strong testimonies. But of late these have not been repeated: and I never knew of any instances in this country in which it succeeded, or indeed of its being trusted to without blood-letting. With respect to the use of it at present in France, it may be observed, that *Mr. Lieutaud*, on the subject of the inflammatio pectoris, has not once mentioned its use; and in his second volume, where he was obliged to mention it as an article of the materia medica, he has the following paragraph: “A nonnullis primi subsellii laudatur in cachexia et hydrope: nec desunt, qui illam pro egregio resolvente in pulmonum phlogosi deprædicent; penes quos sit fides.”

The analogy from its supposed powers in inflammatory diseases has occasioned its being employed in rheumatism. And we have had some instances of its being useful, especially where it operated by producing sweat.

Mr. Bouvart, of the Academy of Sciences, found the seneka to be a cure of dropsy: and we have had several instances of its efficacy when employed so as, in the manner above mentioned, to operate both by stool and urine; but it has also in many instances failed: and as a nauseous medicine, which the stomach does not easily bear in the necessary quantity, it has not been often employed.

GENISTA.

Though very little in use, I have inserted this in my Catalogue from my own experience of it. I found it first in use among our common people; but I have since prescribed it to some of my patients in the manner following: I order half an ounce of fresh broom tops to be boiled in a pound of water till one half of this is consumed: and of this decoction I give two table-spoonfuls every hour, till it operates by stool, or till the whole is taken. It seldom fails to operate both by stool and urine; and by repeating this exhibition every day, or every second day, some dropsies have been cured.

The cineres genistæ, though employed by *Sydenham* and many others, have no advantage over other fixed alkaline salts.

SAMBUCUS ET EBULUS.

We put these together as species of the same genus, and of very similar virtues. I have hardly been acquainted with them in practice: but my respect for *Dr. Sydenham* engages me to give them a place here.

He has told us that a decoction of the middle bark of this tree operates both upwards and downwards, evacuating a great quantity of water both by stool and urine; and by that means he had cured many cases of dropsy.

Some other practitioners have recommended the same remedy: and I have often thought of imitating the practice, but have been prevented, by being uncertain of the dose; *Dr. Sydenham's* three handſful being a very uncertain measure. And I could not trust the spurious work of *Böerhaave* assigning the dose more exactly, when I perceived from several accounts, that the operation of this medicine must be in a strong degree, and that it has been often carried to a dangerous excess.

Both the flowers and berries of the elder have been commended for many virtues; and I will not deny that they have some. But I can say, that in a hundred instances of their employment I could never discover their power and efficacy to be considerable, or indeed to deserve any attention.

OLEUM RICINI.

The seed which affords this oil may be made into an emulsion, and employed as a purgative. In this form it may be more agreeable to some persons than the oil. But the dose is not easily determined; the state of the seeds, as imported from the West Indies, not being uniformly the same. The oil, therefore, as obtained in the West Indies from the seed by expression or boiling, is the medicine we very constantly made use of; and, when the stomach can be reconciled to it, is one of the most agreeable purgatives we can employ. It has this particular advantage, that it operates sooner after its exhibition than any other purgative I know of, as it commonly operates in two or three hours. It seldom gives any griping: and its operation is generally moderate, to one, two, or three stools only. It is particularly suited to cases of costiveness, and even to cases of spasmodic colic. In the West Indies it is found to be one of the most certain remedies in the dry belly-ach; or colica pictonum. I have never found it heating or irritating to the rectum; and therefore have found it sufficiently well suited to hæmorrhoidal persons.

The common dose of this oil is a table-spoonful or half an ounce: but many persons require a double quantity; and there is seldom any harm arises from a little increase of the common dose. It is particularly to be observed of this medicine, that if it be frequently repeated, the dose of it may be gradually more and more diminished. And I know instances of persons who, formerly of a costive habit, at first required half an ounce or more for a dose; but after being

frequently repeated, they now find that two drachms are enough at least to keep their belly regular.

The only inconvenience attending the use of this medicine is, that as an oil it is nauseous to some persons; and that, when the dose is large, it occasions sickness at stomach for some time after it is taken.

To obviate these inconveniences, several means have been tried; but I shall not detail these here, as I can assert, that the most effectual means is the addition of a little ardent spirit. For this, in the West Indies, they employ rum: but that I might not withdraw any part of the purgative, I employ the *tinctura sennæ composita*, or *elixir salutis* of the Edinburgh dispensatory. This, added in the proportion of one to three parts of the oil, and very intimately mixed by their being shaken together in a phial, both makes the oil less nauseous to the taste, and makes it sit more easy on the stomach.

With respect to this oil, I have only one remark farther to make. As it is imported from the West Indies, and especially as procured there by boiling, it very readily acquires some degree of rancidity: but if the patient's taste and stomach can by the means above mentioned, be reconciled to it, this rancidity does not seem to diminish the purgative quality.

SENNA.

This is a medicine of frequent use in Britain, which I have been much surprised at, as it is not agreeable either in its taste or flavour; as it must be always in a bulky dose; and as it seldom operates without a good deal of griping. In spite, however, of all this, it is still in frequent use, which shows me how much the most part of practitioners are guided by imitation and habit.

Allowing, however, for the faults of senna hinted at, we must still admit that it is a very certain purgative, operating moderately, and seldom to excess: but with these latter qualities, it is still a purgative only, without any peculiar virtues.

It is not conveniently employed in substance, as it must be in a bulky dose, not less than a drachm or more. It is, however, in substance, employed in some compositions, as in the *electuarium lenitivum* of both colleges. This too is in more frequent use than I would expect; but I have neither time nor patience to enter upon the criticism of this composition, which in many respects I think it might admit of.

The senna is more conveniently employed in solution than in substance. It is very conveniently extracted by water, but does not bear a boiling heat, having much of its purgative quality thereby dissipated. To render it an effectual purgative, that may operate without griping, it requires a large proportion of the menstruum, not less than four ounces of water to a drachm of senna, which makes a bulky dose.

The senna may likewise be properly enough extracted by a proof-spirit, but with the same difficulty of having it as a purgative in

doses of a moderate bulk. The tincture of the London College can hardly be given as a purgative, without giving a greater bulk of ardent spirit than most men can or should bear. Even the tincture of the Edinburgh College, though not so faulty in this respect, is still too much so, and would be still more, were it not for the substitution of jalap for rheubarb, which has been made in the two last editions of their Dispensatory.

As senna, whether extracted by water or spirit, is still liable to be a griping purgative; so there are almost always some aromatics added to the infusions of it, which, though they do not always obviate the griping, are always useful in covering the flavour and taste of the senna. What aromatics are most fit for every purpose intended, we dare not determine: but from some trials and comparisons we have made, it appears that, for covering the taste and flavour, the coriander seeds are the most agreeable and most effectual. But if the purpose is to prevent griping, it is possible that some of the warmer aromatics, as cardamons, or ginger, may be more effectual.

HELLEBORUS NIGER SIVE MELAMPodium.

The state of this root is so uncertain and unequal in this country, that I have hardly ever employed it, or seen it employed, by itself as a purgative: and must therefore leave my readers to get information concerning it from better hands.

I have not found any body in this country who has had so much faith in *Bachier's* tonic pills, as to take the trouble of preparing them; and therefore we know nothing of their very singular virtues.

Upon the authority of Dr. Mead, the black hellebore has been often, and I have seen it often, employed as an emmenagogue. But whether from the imperfect state of the medicine, from improper administration, or from other causes, I would not determine; but I can assure my readers, that in many trials I have never found the emmenagogue virtues of this medicine, nor have I met with any practitioners of this country, though often trying it, who had better success in this respect; and particularly, neither in my own practice nor in that of others, have I met with one instance of the power of hellebore in producing hæmorrhagy.

JALAPPA.

Here is a medicine more uniformly of the same condition and of more certain efficacy. Even to the eye-sight the entire root contains, a resinous part; and which can, in considerable quantity, be extracted from it by spirit of wine, leaving the residuum nearly quite inert. The resin thus separated is an acrid inflaming matter, which, thrown into the stomach, proves a drastic purgative; but it is rendered milder by being divided by a triture with any hard powder before it be exhibited. It is certainly by its resinous part that the entire jalap proves purgative, and in large doses proves a strong one. But as it is given in powder, the previous triture, by dividing the resin, renders the entire jalap a milder medicine than the resin taken separately. It may

be given to persons not very irritable, to half a drachm for a dose, but lesser doses will commonly answer; and while it very certainly operates, it is commonly without violence, and often without griping. If it be well triturated, before exhibition, with a hard powder, and the crystals of tartar are the fittest for the purpose, the jalap will operate in lesser doses than when taken by itself, and at the same time very moderately and without griping. Except when given in very large doses, I have not found it to be heating to the system. And if it be triturated with a hard sugar, it becomes, in moderate doses, a safe medicine for children, which in this form they will readily receive, as the jalap of itself has very little taste.

While jalap may be thus rendered mild and safe, it may, however, by being given in large doses, and especially by being joined with Calomel, be rendered one of the most powerful purgatives, either as a hydragogue, or as an anthelmintic, and, if we mistake not, with more safety than any of the other drastic purgatives.

Hitherto I have spoken of the jalap as exhibited in a solid form: but it may be conveniently brought into a liquid. It does not give out its purgative quality to water, which renders it, therefore, of no use in watery infusions: but it is very properly extracted by a proof-spirit: and as this does not extract the resinous part by itself, and only as mixed with, and diffused in the gummy part, the brandy tincture proves a tolerably mild medicine. Rendered more agreeable by the addition of a little syrup, I have known it frequently given to children with great safety; and if I am rightly informed, it was the purgative employed by the inoculators, who got their instructions from *Sutton*.

We recommended above the tinctura sennæ compositæ, for certain purposes, to be mixed with the oleum ricini. But we must now observe, that the tinctura jalappæ is equally, and perhaps more, fit for the same purposes.

SCAMMONIUM.

This is a medicine which is offered to us in very different conditions, insomuch that I have known different parcels of it at the difference of 200 per cent. in their prices. This must be owing to its frequent adulteration: and as we cannot suppose that our apothecaries are always on their guard against this, the practitioners of this country have not employed this medicine so much as to allow me properly to report its effects. When it is genuine, it seems to be an useful purgative; and though operating in a small dose, it does not seem to be in proportion violent. With respect to the manner of using it, as in its composition it has a considerable portion of resin, upon which its purgative qualities seem to depend, it may certainly be rendered milder by being triturated with sugar, or crystals of tartar, as ordered in the dispensatories. But in any form it does not seem to have any advantage over the jalap; and I am persuaded, that

either by itself, or in composition, it will never come much into the practice of this country.

RHAMNUS CATHARTICUS.

The berries of this shrub are the only part of it employed : and they may be employed in various states. But the only one known to us, is that of the juice made into a syrup, as ordered in the Dispensatories. In this state they are powerful purgatives : and, as both griping to the bowels, and heating to the system, they may be considered as of the drastic kind, and accordingly they have been frequently employed as hydragogues. In moderate doses they have been employed by our vulgar as a common purgative. But the state of the medicine, with the hazard of its violence and griping, will prevent their being used by refined practitioners.

As, however, the violence and griping of this medicine can be commonly prevented, by drinking largely during its operation, of any mild liquid, I have known it frequently used by persons drinking goat-whey.

GAMBOGIA.

This is a powerful purgative ; and has accordingly been long considered as a chief hydragogue. For this purpose, however, it must be employed in a large dose, when it commonly works with violence both upwards and downwards — Upon account of this violent operation, we have seldom employed it by itself ; but have found, that in a few grains it might be usefully and safely added to doses of jalap and calomel.

In this manner I formerly practised with gamboge ; but of late I have thought of using it by itself, in the following manner. Observing that it was a purgative which passed through the intestines more quickly than almost any other, I have judged that moderate doses of it might be repeated soon after one another with more safety, and with more effect, than by giving large doses at once. Accordingly, I have given doses of three or four grains, rubbed with a little sugar ; and repeating these every three hours, I have found it operate without vomiting or griping : and at the same time, after three or four such exhibitions, a great deal of water was evacuated both by stool and urine. Although I have not yet had much experience of this management, I have no doubt of its being adapted to the cure of dropsy with more ease to the patient than in any other manner of exhibiting it.

For a long time past the gamboge has been famous over Europe as the fittest and most effectual medicine for expelling the tænia or tape-worm. Of this power, I have had few opportunities, from experience, that could enable me to make any useful observations upon it. And I judge it best to refer my readers to Professor *Murray's Apparatus Medicaminum*, for the most full and accurate information on this subject.

To render my catalogue of purgatives complete, I have in-

serted here two articles, *Nicotiana* and *Veratrum*. Of the former article, and particularly of its purgative powers, as thrown into the rectum, I have treated already; and of the latter I shall say a little here.

VERATRUM.

The London College, in the edition of their Dispensatory for 1746, as an officinal medicine, gave a tincture of this root. But they have omitted it in their last edition: and I am not surprised at this; as it is a very poisonous plant, which I would hardly think of employing even upon the authority of the estimable *Conrad Gesner*.

It is, however, possible that such an active substance may be useful in certain diseases of the human body. And my very ingenious and learned friend *Dr. Smyth* very properly tried it in some cutaneous diseases, which are commonly very refractory. He succeeded in two or three cases; but his experiments have yet been few: and in some of these he made, the operation of the medicine was such as shows that it is to be employed with a great deal of caution.

COLOCYNTHIS.

This is one of the most drastic purgatives: and I have never employed it but as it stood in certain compositions of the Dispensatories. Even these are much less in use than they formerly were. Upon the subject of the *pilulæ ex colocynthide cum aloë*, we made a remark which will also apply to the *extractum colocynthisidis compositum* of the London College; and with respect to both, I would now add, that as, in employing the colocynth, these medicines are drastic purgatives of no other peculiar virtues, I suppose we may find for them more agreeable substitutes.

ELATERIUM.

This peculiar substance is variously prepared; and therefore, in our shops, is in different conditions. When properly prepared it is a drastic purgative, which however seems to have been very much employed by *Sydenham* and *Lister* in the cure of dropsy. I have not known it employed by itself, and only as being added in a grain or two to other purgatives, as *Sydenham* and *Lister* employed it; but what is the effect of it in composition, it is not easy to determine. If *Lister's* observation, of its being very heating to the body, be well founded, I should not think of employing it at all.

CHAPTER XXI.

DIURETICA.

THESE are medicines suited to promote the secretion of urine.

This is to be done either by increasing the quantity of water in the mass of blood, or, that remaining the same, by introducing a matter that may be a stimulus to the kidneys.

As when any quantity of water is taken into the body, we find this commonly, in the course of twenty-four hours, returning to the same weight it was of before; so we conclude that the water thrown in has passed out by the excretions of perspiration and urine. And in general we find it probable that these excretions will be very much in proportion to the quantity of water for the time present in the mass of blood; wherefore if the perspiration be determined, an increase of the water present in the blood will occasion an increase of the secretion of urine, which accordingly commonly happens: and we commonly find that an increase of the quantity of drink is attended with a proportional increase in the quantity of urine secreted.

This therefore is the foundation of the first means we have assigned for promoting the secretion of urine. The quantity of water present in the mass of blood may be different from different circumstances. But the most part of these circumstances are hardly under the direction of our art; and the only one which is very much so, is the quantity of liquid taken into the body by drinking; which being therefore the chief means in our power of increasing the quantity of water in the blood, may be considered as a chief means of increasing the secretion of urine: and accordingly this increase of drink has always been considered as the chief of diuretics.

There are, however, certain states of the body, in which it may be doubtful if this means of increasing the secretion of urine may be safely employed. It sometimes happens that the water of the blood, instead of passing off by the excretions, is effused into some of the cavities, giving occasion to the well-known disease of dropsy: and in such a case it may be suspected, that an increase of the water in the blood, made by an increase of drinking, may increase the effusion mentioned, and aggravate the disease. This suspicion has prevailed so much with physicians, as to lead them, in such cases, to enjoin as much as possible an abstinence from drinking; and it is alleged that such an abstinence has, in some cases, entirely cured the disease.

We would not rigorously inquire into the truth of this fact; but from all we have seen or heard, we are confident that it has been a very rare occurrence: and from the many instances we have had of its being attempted with very little benefit, we are not surprised at many physicians being of opinion that it should not be attempted at all.

It is an extremely painful measure, as it resists the urgent desire of drink which commonly attends this disease; and it may be alleged that it is not always necessary, as the tendency to effusion may have its limits; so that the whole of the drink taken in may not run off this way, but that a portion of it may still pass by the kidneys. So far as this happens, the taking in of drink may be a safe measure: and I can assert, that in several cases of considerable dropsy, the quantity of urine voided was nearly equal to the quan-

ty of drink taken in, which shows that the drinking had been a very proper measure.

I wonder, indeed, that the practitioners who have enjoined an abstinence from drinking, have not thought of a means of determining how far this was to be carried; and which certainly might be nearly determined by a comparison of the quantity of urine voided in a given time, with the quantity of drink taken in during the same time.

I have frequently made this comparison; and found, that a very entire abstinence from drinking, by diminishing the quantity of urine voided, allowed the secretories of the kidneys to fall into a contracted state, so that the quantity of urine voided was still farther diminished, and, as I judged, tended to increase the effusion, and thereby to aggravate the disease. In other cases I found, that when a quantity of drink was taken in, a considerable portion of it passed by the kidneys; and when, as it sometimes happened, the quantity of urine voided was equal to the drink taken in, I concluded that the giving so much drink was a perfectly safe measure.

To illustrate this matter farther, I must observe, that the water of the blood carrying the saline matters of it, by the nature of the animal œconomy, is determined to the excretions, and particularly to the kidneys; and therefore, that drinks impregnated with saline matters, are naturally determined this way rather than by the preternatural effusions mentioned. The fluid poured out by these effusions is nearly insipid; whilst, though the watery part of the blood is by these withdrawn from the secretories of the kidneys, yet a great quantity of the saline matter of the blood continues to pass this way: and I therefore have been led to give for drinks, not simple water, but always water impregnated with saline matters: and I can assert, that water so impregnated passes more certainly to the kidneys than perfectly insipid liquors.

Thus, water, impregnated with vegetable acids, is not only more grateful to the patient than simple barley-water, or water-gruel, but passes always in greater quantity in proportion to the liquid taken in: and it is commonly by attending to this that I have found, even in dropsy, the quantity of urine voided to be equal to the quantity of drink taken in.

I have thus endeavoured to explain some circumstances in which a total abstinence from drink may be improper: and I have pointed out some in which the giving drink may be a safe measure; whence the avoiding of this should not have been so universal a rule as it has been with the most part of practitioners.

In arguing for the exceptions that are to be made from this rule, we have alleged that the taking in of drink is proper, especially when we can find the quantity of urine voided to be equal, or nearly equal, to the quantity of drink taken in; and that we especially found this to be the case when the drink employed was impreg-

nated with some saline matters, which determined it to go more entirely to the kidneys, and even to stimulate these to a more entire secretion. Reflecting upon this, I perceived that I had omitted in my Catalogue of diuretics some matters which are particularly well suited to the purpose of drinks, such as fermented liquors of all kinds, when these are either weak in their quality, or taken pretty well diluted with water.

Even ardent spirits, if largely diluted and joined with a portion of vegetable acid, have been found to stimulate the kidneys, and to make a proper part of the ordinary drink. It was also an omission amongst the diuretics, not to mention the milk of the non-ruminant animals, and of the other milks, their products of whey and butter-milk, especially when these are in their most acid states.

To finish what relates to the giving of drink in dropsy, I must observe, that whenever we can perceive that the quantity of urine voided is equal to the quantity of drink for the same time taken in, I hold it to be safe to allow as much drink as the patient may desire; and I have no doubt that, by such indulgence, the disease may be often entirely cured. There are indeed many instances of the disease being cured in this manner; as in the cases given by *Sir George Baker* in the Medical transactions, in those quoted by *Dr. Milman* from several authors, and especially in the instances given by that ingenious author from his own practice.

I can give none from mine; but one accidentally fell under my observation. A woman labouring under an anasarca was accidentally directed to drink a mineral water, and that in considerable quantity. By this her urine was greatly increased, and the anasarca was soon entirely cured.

From my own practice I can observe, that I always thought it absurd in physicians to employ diuretics while they enjoined an abstinence from drink, which is almost the only means of conveying these diuretics to the kidneys: so, whenever I employ diuretics, I at the same time advise drinking freely; and I am persuaded that drinking largely has often contributed to the cures I have made.

Having thus mentioned the conduct of a chief means of promoting the secretion of urine, before I proceed to the other means that may be employed, I judge it proper to mention the chief effects of promoting this secretion.

As it seems to be the purpose of nature to carry out by this secretion the saline matters that, by the nature of the animal œconomy, are constantly generating in the mass of blood; so, by increasing the secretion, we carry out those saline matters, which, from certain causes, abound more than ordinary in the mass of blood.

Such a superabundance of saline matter in the blood I suppose to take place in scurvy; and accordingly we find, that increasing the secretion of urine is the chief means of curing that disease.

But as there are other causes than those producing scurvy which may increase the saline state of our fluids: so the increase of the secretion of urine may be a means of curing many diseases, though we are not ready to point out those in particular that may be so cured.

The supposing an acrimony, or, what I judge to be the same thing, a saline state of the fluids, has been often assumed at random, without evidence. And even in cases where it was certainly existing, there are certain acrimonies which do not readily pass by the kidneys; and therefore diseases depending upon them which are not to be cured by increasing the secretion there.

Hence it is that the increase of this secretion may not prove a remedy in so many cases as we might suppose it. On the other hand, it is to be observed, that as there is a balance between the perspiration and the secretion of urine, so that the one being increased, the other is diminished; if there be a matter which nature has intended to pass especially by the perspiration, if this is retained by increasing the secretion of urine, diseases may be produced. And even if the increased secretion of urine should diminish the quantity of water which should pass by the skin, the saline matters which should pass that way by their being less diluted, may be more ready to stick in the vessels of the skin, and thereby give occasion to diseases of this kind.

Another effect of an increased secretion of urine may be considered as merely the evacuation of the water, or watery parts of the blood, which, when largely increased, may excite an absorption from the cavities, in which a preternatural accumulation of serous fluid had taken place. Thus it is that an increased secretion of urine has often proved a cure of dropsy: and for the conduct of this, by either one means or another, enough has already been said above; for I doubt much if any diuretic medicines will ever be very effectual without being accompanied with an increase of the water in the blood by the taking in of drink.

PARTICULAR DIURETICS.

WE begin with those taken from the vegetable kingdom; and must introduce them by observing, that in making the Catalogue, I have been more directed by my complaisance to the writers on the subject than by my own opinion and experience. The most part of the diuretic vegetables mentioned by writers are of very little power, and are employed with very little success.

But, to speak of particulars, the first mentioned are the *Umbellatae*, the power of which resides especially in their seeds; but we have never found any of them powerful. The semen dauci silvestris has been commended as a diuretic: but we have seen it employed in calculous cases in considerable quantities, and for a great

length of time, but never found its diuretic power any wise remarkable.

Some of the *plantæ stillatæ* have been commended as diuretics : but none of them deserve our notice, except the

RUBIA TINCTORUM.

This root passes so much by the kidneys as to give its colour to the urine ; and in passing that way it may be supposed to stimulate the secretories : and indeed it has been represented as a powerful diuretic. I have seen it frequently employed as a supposed emmenagogue : but its diuretic powers did not always appear, and never to any considerable degree. As in the many experiments made with this root on brute animals, it has always appeared hurtful to the system, I should not think it fit to be employed to any extent in men.

ALKEKENGI.

The berries of this, the only part of it ever in use, are not known in the present practice : and I have never seen them employed. But I have some reports of their being employed by others without effect : and if their diuretic powers had ever been remarkable, we may presume that they would have still continued in use. I cannot dismiss them without an observation, that as it is allowed that the berries often take a taint from the leaves of the plant ; it will always require some caution in employing any part of a plant which is taken from an order of a very poisonous kind.

The *Bardana*, *Gramen*, *Lithospermum*, *Ononis*, *Asparagus*, *Emula*, *Campana*, are all substances which seem to pass in some measure by the kidneys : but from frequent experience we can assert, that their diuretic powers are hardly ever to be taken notice of.

In the catalogue of diuretics I have inserted the *Asarum*, for the sake of this remark, that it is doubtful if any of the supposed diuretics in stimulating the kidneys show any specific power ; and on the other hand, many which do stimulate these organs show the same power with respect to every other excretory to which they are applied : and hence it is that every emetic and purgative show, upon occasion, their diuretic powers. This seems to be all that is necessary to be said of the *Asarum*, *Genista*, *Nicotiana*, and *Seneka*, as inserted in our catalogue of diuretics ; as they are seldom employed in this intention alone.

The *Arum*, in its recent state, contains an acrid matter, which, like other acrids, passes, at least in part, by the kidneys, and in proportion excites the secretion there : but it can never be introduced into the stomach in such quantity as to become a powerful diuretic.

Upon the same ground of their containing a great deal of acrid matter, which passes more or less by the kidneys, I have inserted in my list the *Persicaria* and *Ranunculus*, which have been commonly marked as diuretics. They have, however, as such been

hardly employed in practice : and that for the same reason I have given with respect to the arum, that we have not yet learned how they can be introduced in such quantity into the stomach as to become powerful in the kidneys.

DULCAMARA.

We have employed only the stipites or slender twigs of this shrub : but as we have collected them, they come out very unequal, some parcels of them being very mild and inert, and others of them considerably acid. In the latter state we have employed a decoction of them in the cure of rheumatism, sometimes with advantage, but at other times without any effect. Though the dulcamara is here inserted in the catalogue of diuretics, it has never appeared to us as powerful in this way : for in all the trials made here, it has hardly ever been observed to be in any measure diuretic.

DIGITALIS.

The powers of this plant as a diuretic are now ascertained by numberless experiments ; but upon what sort of operation these powers depend, I am at a loss to explain. Whether it be by a specific stimulus applied to the kidneys, or by a general operation upon the system, which particularly affects the kidneys, does not appear very clearly. The small dose in which the digitalis commonly operates, makes it difficult to suppose that so much of that dose can go to the kidneys, as to be a considerable stimulus to these organs ; and, on the other hand, the effects of that dose on the stomach and intestines, and especially its effect in diminishing the frequency of the pulse, are certain proofs of a general operation upon the system.

I have introduced this speculation, that some of my readers may prosecute the inquiry. But I do not take any pains at present to decide the question ; because I do not perceive that either opinion can have any influence upon practice.—This, abstracted from all speculation, must be established by experience. With respect to this I would wish to lay down here rules for the proper management of this medicine : but I will not attempt it, because I can direct my reader to a more proper means of instruction by referring him to the treatise of my very ingenious and learned friend *Dr. Withering*, on this subject, which is a treatise in many persons' hands, and, in my opinion, should be in the hands of every practitioner of physic.

I cannot however quit this subject of the digitalis without observing, that the speculation with regard to its operation, which I have started above, may occasion the general account of the operation of diuretics, which I have given above, to appear less complete ; as, besides the increased quantity of water in the mass of blood, or a stimulus particularly applied to the kidneys, there may be a medicine which, by a general operation on the system, may promote the secretion of urine. My candour obliges me to men-

tion this ; but I do not find myself at present in a condition to prosecute the inquiry.

RUTA ET SABINA.

These two plants, as well as the general title of *Amara*, have been inserted in my catalogue of diuretics inadvertently ; for I do not find, either from writers, or from my own experience, any authority for ascribing a diuretic virtue to these plants.

SCILLA.

This is a root which from the most ancient times has been celebrated as a diuretic ; and, under a proper management, it seldom fails to operate more or less as such. It has not, however, any specific power ; as it seems to be universally stimulant with respect to every sensible part or excretory to which it is applied. It readily stimulates the stomach, and proves emetic, as we observed above when speaking of it under that title. When it is so managed as to pass the stomach, it stimulates the intestines, and proves purgative ; and when carried into the mass of blood, it is generally, and I believe justly, supposed to stimulate the mucous glands of the lungs, and prove an expectorant.

When it is thus so generally stimulant, we can readily understand why it should prove a diuretic : and I would add, that probably it has something in the nature of the acrimony it contains, that suits it to be taken up by the serosity, and thereby to pass readily by the kidneys, where its acrimony therefore increases the secretion.

This actually happens, and has rendered it at all times noted as a diuretic.

This effect, however, does not always happen ; because, if it be thrown into the stomach in such quantity as to prove emetic or purgative, it is thereby prevented from reaching the blood-vessels and kidneys ; and therefore, to obtain its diuretic effects, we must avoid its emetic and purgative operations, which may commonly be done by giving the squills in small doses, to be repeated after proper intervals only : and I have found, that by accompanying the squills with an opiate, the emetic and purgative operation of it may be avoided, and thereby it may be carried more entirely to the kidneys.

A certain writer has alleged, that the diuretic effects of the squill is not to be expected unless it shows some operation on the stomach. This may perhaps be founded : but I understand it no otherwise than that some operation on the stomach is a test, and a necessary test, of the squills being in an active state : in the same manner as we are only certain of the activity of mercurial preparations when they have shown some effect in the mouth.

I have often observed, that when the squill operates strongly in the stomach and intestines, the diuretic effects were less ready to happen ; and therefore, as the squill contains an acrimony that is in part very volatile, and which is most ready to act on the stomach,

that the fresh squill, by acting more upon the stomach, is less certainly carried to the kidneys than when its volatile part is in some measure dissipated.

It is on this account that the dried squill is more frequently employed than the fresh. We must not however omit to observe here, that the drying of the squill is a business that requires much attention; as it may readily be overdone, and thereby render the squill entirely useless: and it is to be observed also, that the squill may not only be rendered inert by the first drying being too much, but that the dry powder, if it be kept long in a dry air, may also in time lose much of its power.

This overdrying of the squill, in one way or other, happens more frequently than our apothecaries are aware of; and has led me to allow, that some operation on the stomach, some nausea excited by the squill, is a necessary test of the activity of the portion of it employed.

When the squill is in good condition, to avoid its operation on the stomach and intestines, I have said it is proper to give it in small doses, to be repeated after long intervals only. But it is proper to observe here, that when the disease requires a repetition, the doses of the squill, as they are repeated, may be gradually increased, and the intervals of their exhibition made shorter; and when they come to be tolerably large, it is then that an opiate may be conveniently employed in directing the operation of the squill more certainly to the kidneys.

In the cases of dropsy, that is, when there is an effusion of water into the cavities, and therefore that less water goes to the kidneys, we are of opinion that a neutral salt accompanying the squill may be of use in determining this more certainly to the kidneys: and whenever it can be perceived that it takes this course, we are persuaded that it will also be always useful, and generally safe, during the exhibition of the squills, to increase the usual quantity of drink.

It may be a question, Whether the diuretic operation of squills may not be assisted by some mercurial preparation given at the same time? And when there is any appearance of the medicine going to the kidneys, it cannot be doubted that the mercury, as stimulant of every excretory to which it is applied, may here also be useful. Accordingly it has been a frequent practice to join mercury with squills: but I doubt much if the common practice of employing calomel on this occasion be proper. Calomel determines the squill more certainly to operate by stool: and unless the cure of the disease is to be trusted entirely to purging, the calomel may readily prevent the diuretic operation of the squill. We have therefore been of opinion, that the less purgative preparations of mercury were better suited to the purpose: and we are disposed to judge that the solution of the corrosive sublimate, which so often by itself goes to the kidneys, may be more proper than any other.

After treating of the squills, it seems proper to take notice of a title inserted in my Catalogue that has some affinity with the squills ; which is that of the

ALLIACEAE.

All of these seem to contain an acrimony, which seems by its nature to be determined to pass off by the kidneys. And the species *Allium sativum*, or *Garlic*, which possesses the largest portion of this acrimony, has been always celebrated as a diuretic.

I have treated of its other virtues pretty fully above ; and have only to add here, that when it is taken into the stomach in its fresh and recent state, it almost always operates as a diuretic. And I am well persuaded, that in several instances of my practice it has contributed to the cure of dropsy ; but I have not been so happy as *Dr. Sydenham* was, to find the disease cured by garlic alone. Practitioners have been of opinion, that the garlic is most effectual, when by its being taken in an entire state, as explained above, it has been left to the stomach to extract the more volatile parts of it.

After the alliaceæ I must take notice of some substances which have much affinity with these : and therefore, in the Catalogue, we have given the article of

SILIKUOSAE.

These contain a volatile acrimony, very much akin to that of the alliaceæ, and like these seemingly disposed to pass off by the kidneys. They have therefore been always considered as diuretics.

There is however a considerable difference in this respect between the different species of this order of plants. In the leaves, stalks, and flowers, and sometimes in the roots, the acrimony peculiar to the order is not very remarkable ; and they show little power as diuretics. But in others, especially in their seeds, and sometimes in their roots, the acrimony is very considerable ; and so far as it can be introduced to the kidneys, it is a powerful diuretic. This stronger acrimony, however, is so ready to inflame the stomach, that hardly so large a quantity of it can be introduced as to prove a powerful diuretic, or to be depended upon in dropsies, where a large discharge of urine is required. The entire seeds may, indeed, as we explained above, be introduced in large quantities, and are in some measure extracted by the stomach, so as to be in some measure diuretic ; but never so much as to act in this way very powerfully.

There remain of the Catalogue of vegetable diuretics two articles to be taken notice of ; which are the

BALSAMICA ET RESINOSA.

With respect to the balsamica, as I have said above, that all of them have for their basis a turpentine, so it may be presumed that all the balsams may have the same diuretic quality which we find in the most simple turpentine. This we have said before to be commonly determined to the kidneys, operating there more or less as a diuretic : and therefore the general title of *Balsamica* is properly enough inserted in our Catalogue. I must, however,

observe with regard to them, that they cannot possibly be introduced into the body in such quantity as to operate powerfully in any diseases requiring a large discharge of urine.

The diuretic substance afforded by turpentine, which has been the most taken notice of, is the essential oil obtained by a distillation with water. In attempting the cure of sciatica by this oil, I have frequently observed its passing by the kidneys, and promoting the secretion of urine: but it can never be introduced in such quantity as to be powerful in this way.

This observation applies to the *oleum juniperi*, which has been often employed as a diuretic; and it will readily appear as this oil is drawn from the terebinthinate substance of the juniper, it can hardly have more power than that drawn from the turpentine itself.

On the subject of the *balsimaca*, I have conceived an opinion which I have in some measure explained already, in the article of *Benzoinum*, amounting to this, that the acid found in the benzoine exists in the oil of turpentine and of the other balsams; and that upon this particularly depend their diuretic virtues. It is therefore that several of the substances inserted under the title of the *Stimulantia Resinosa* might have also been inserted in our Catalogue of diuretics. But their power is not so considerable as to deserve our attention here or in practice.

Having now mentioned the several vegetable diuretics, I am next to speak of those taken from the animal kingdom: and those first deserving our attention are the

CANTHARIDES.

The acrimony of this insect, and, when applied to the skin, its inflammatory nature, which may be readily carried so far as to raise a blister, is well known to all the world: and the effects of its rubefacient and blistering powers, in the cure of many diseases, are known to every practitioner. These effects, however, are not to be taken notice of here. As they may be the effects of other insects, and of many vegetable substances, they are to be considered as a general remedy, none of which I propose to take into our treatise: and it is only the powers of the cantharides, when taken into the body, and employed as an internal medicine, that I am to consider.

The cantharides taken internally, whether in substance or in solution, if in a certain quantity, may be considered as a stimulant and heating substance. And I have had occasion to know them, taken in large quantity as an aphrodisiac, to have excited violent pains in the stomach, and a feverish state over the whole body.

The cantharides, however, seem to act only in a concentrated state; for taken in moderate quantity they are so much diffused in the fluids, both in the alimentary canal and in the mass of blood, that they seldom show any effects on the general system. But this seems to be almost peculiar to this substance, that given even in

moderate quantity, it very readily passes to the kidneys; and from circumstances which we cannot explain, it seems to be there united with a certain portion of the urine only: and being thus in a concentrated state when carried on to the bladder, they give a considerable irritation and inflammation to the neck of it; in consequence of which a frequent stimulus to the voiding of urine, and a painful difficulty in the voiding of it—symptoms very well known to every medical man under the title of Strangury—are produced.—In explaining this very peculiar effect of cantharides I have insinuated a theory of their being united with a certain portion of the urine only, and of their being thereby in a more concentrated state, which will not perhaps appear clear to every body. But that there is a foundation for such reasoning appears to me very strongly from hence, that the effects mentioned are prevented by our rendering the urine more copious, and much diluted.

It was proper for me to begin with an account of this frequent operation of the substance of cantharides. But it does not properly touch the medicinal powers of them, which I must therefore now speak of.

From the effects mentioned, it is sufficiently evident that the substance of the cantharides goes to the kidneys: and it is with much probability supposed, that such a stimulus applied there must promote the secretion of urine. This effect, however, does not always in fact appear; and *Dr. Smith Carmichael* asserts, that in his frequent exhibitions of the tincture of cantharides, he never once observed the secretion of urine increased. In many instances of a strangury produced by the application or exhibition of cantharides, I have not found, though I have often enquired after it, the quantity of urine sensibly increased: and however it may be explained, though the substance of cantharides operates often upon the neck of the bladder, it may be doubted if at the same time it operates upon the kidneys; as, along with the strangury so often occurring, I have never met with pains of the back, or other marks of an affection of the kidneys.

From these observations, it may be doubted if cantharides have properly any diuretic power: but the authority of the late eminent and learned *Werlhof* cannot be declined. In the *Commercium Literarium Norimbergense*, *Werlhof* gives a remarkable instance of the diuretic power of cantharides; and informs us, that he had frequently experienced the same in dropsy and other diseases: and upon such an authority I can no longer doubt of the power in question.

It however may be considered, whether the obtaining the diuretic effects of cantharides may not depend upon that administration of them which *Werlhof* employed. He gave a grain of powdered cantharides for a dose, and repeated this every four hours: and it was only after the third dose, that a suppression of urine, of many days standing, began to yield: and I will give the rest of what

relates to this subject in his own words, *Operum* pag. 699. “ *Post tertium gratum fluere urina parum grumosa sanguinolenta, dein pituitosa, tandem limpida coepit, cum dysuria. Continuavi, quia symptomata cetera statim mitigata sunt, medicaminis usum, ad nonam usque dosin: quo facto magis magisque, et tandem largissime ad plures in dies mensuras sine febre, dolore prodiit urina limpida: imminutis symptomatis omnibus; sensimque sola ejus remedii usueque convaleuit homo jamque sanus vivit.*”

By accidental circumstances I have myself been prevented from imitating this practice. And I was less intent upon it because *Wichman*, the editor of *Werlhof's* works, in a note on this subject, observes that *Werlhof* himself did not continue the use of cantharides in dropsy and other diseases.

All this, however, I thought necessary to lay before my readers.

Cantharides have been frequently employed in the cure of cutaneous diseases, and are for this particularly recommended by *Dr. Mead*: and as they may justly be supposed to pass by perspiration as well as by urine, the instances given of their utility may be very true. My learned friend *Dr. Smith Carmichael*, among other attempts which he thought of for the cure of cutaneous diseases, very properly thought of trying the cantharides. In one case they proved a remedy. But in some others, though given in large quantities, they entirely failed: and, so far as I know, the experiment has not been prosecuted further.

In another disease the cantharides have been frequently employed, and that is in a gonorrhœa and gleet. For their efficacy in such cases, we have the testimony of the same respectable physician *Werlhof*. His words, in the page of his works above referred to, are the following: *Dedi in gonorrhœa in substantia ad granum unum, duo, tria, cum aussis sæpiæ drachma, et pro efficaciæ observatione, continuavi ad plures dies, et minori id cum molestia fieri observavi, quam si pro more Bartholini Lesteri, et aliorum mihi itidem feliciter tentato, infusio in vino facta sit.*”

His editor, however, tells us, that *Werlhof* did not continue this practice, as he had found out a safer method of cure.

As I suppose the operation of cantharides, in the cure of gonorrhœa and gleet, to be by inducing some degree of inflammation upon the urethra, I hold the practice to be of very doubtful safety.

MILLEPEDAE.

These insects, like many others, contain a saline acrimony, which is supposed to go to the kidneys, and prove diuretic.

What large quantities might do, I dare not determine: but I can join my testimony to the account of *Dr. Lewis*, that I have known a large quantity, that of a hundred, given twice a day, without any sensible effect upon the kidneys, and without any effect in curing the diseases for which they were given.

SALES DIURETICA.

These, in the printing of my catalogue, should have been sepa-

rated from the foregoing articles by a proper space, as they cannot be properly placed under the titles of either animal or vegetable diuretics.

With respect to the whole of them, it is to be observed, in the first place, that as it seems to be determined by the nature of the animal economy, that all saline substances received into the mass of blood, should soon pass out again by the excretions, and particularly by that of urine, it will be obvious that as all saline matters are more or less stimulant, they must all of them, in passing by the kidneys, be more or less diuretic.

Accordingly their power in this way is a matter of common experience: and all of them may be employed as diuretic medicines, except the volatile alkali, which cannot be introduced in the quantity necessary to have much effect upon the kidneys.

The acids, in their concentrated state, cannot be admitted; but by being largely diluted with water, or watery liquors, they can be admitted in considerable quantity; and in this diluted state they sometimes prove powerful diuretics. The fossil acids, however, can hardly be admitted in such quantity as to produce any large discharge of urine. But the vegetable acid, in its various forms, can be taken in more largely, and prove very useful, particularly by rendering watery liquors more agreeable as drinks, and by conveying these more certainly to the kidneys, as explained above.

The neutral salts, whether formed of acids and alkalines, or of acids and earths, are all of them diuretics in so far as they reach the kidneys. But many of them are at the same time laxative cathartics, and their operating by this quality commonly prevents their diuretic effects. These, therefore, can only be obtained by the exhibition of neutrals, when they are given in such small doses as cannot act upon the intestines, and when these doses are repeated at certain intervals only. But even in this way I could hardly ever render the diuretic effects of neutrals, even those of nitre, considerable.

There is, however, a neutral salt that is judged to be more certainly diuretic than any other, and has therefore been entitled *Sal Diureticus*. It is very possible that this salt may be more active in the kidneys than some others: and I think I have sometimes observed it to be so. But with respect to it in general, I must declare, that, though trying the exhibition of it in various ways, I could never render its diuretic effects remarkable, or fit to be depended upon, when a large discharge of urine was required.

To conclude this subject, they are the fixed alkaline salts that have been especially depended upon as diuretics. It has been the vegetable fixed alkali only that I have employed, and have sometimes obtained its diuretic effects in a remarkable degree. But I have often also been disappointed of these: and I was not surprised at this, as I believe that the alkali is almost always rendered neutral in the stomach: and in that state they could have no other

effects than that of other neutrals, which I have just now represented as commonly inconsiderable.

It is, however, still a matter of fact, that alkalines do, upon occasion, show their diuretic power: and upon the supposition just now made, of their neutral state in the stomach, their considerable operation as diuretics is not easily accounted for. On this subject, however, I shall offer two explanations: one is, that the quantity of alkali thrown into the stomach may be more than the acid there can neutralize; and therefore, that some portion of it may reach the kidneys in its alkaline state, and prove there a more powerful stimulus than any neutral salt would be. It is upon this ground that I find a large quantity of alkali to be always necessary to show diuretic effects.

Another explanation of the powers of alkali in producing these is the following: as the acid of the stomach may be presumed to be of the nature of the fermented acid of vegetables, so an alkali joined with it must form a regenerated tartar, a *sal diureticus*, or *kali acetatum*: and if this be less purgative, and more diuretic than other neutrals, while it is also conveyed to the blood-vessels in larger quantity, we can understand why, from these circumstances, the fixed alkali may often appear diuretic. With respect to its operation as diuretic, I have another conjecture to offer. I have commonly found it to prove diuretic when given with bitters, as was the manner of *Sir John Pringle*. And I have imagined, that, as the bitters are absorbents of acid, they might absorb so much of that present in the stomach as to prevent this from being so fully applied to the alkali.

I have now only to add on this subject, that, as alkalines may be often prevented, by purging, from reaching the kidneys; so their diuretic effect may be often more certainly secured by giving an opiate at the same time: and for the utility of this practice, see *Dr. Mead*, on the subject of dropsy.

After the diuretic salts, I have set down in my catalogue the *Sapo Albus Hispanus*. But after what has been said above, with respect to this medicine, I need not add any reflections here.

CHAPTER XXII.

DIAPHORETICA.

UNDER this title I comprehend all the medicines suited to promote a discharge by the skin, whether it be by insensible perspiration or by sweat. In the common language of writers, the term of *diaphoretica* is applied to those medicines only which promote the insensible perspiration; and those which occasion sweating they distinguish by the term of *Sudorifera*, or *sudorifica*: but as, in the medicines ranged by authors under these titles, we can find no difference but in the degree of force, or what arises from the manner

of administration, we comprehend the whole under the title of Diaphoretica; and shall employ this term only, though the effects of the medicines may be often the occasioning of sweat.

We set out with the following proposition.

All of the diaphoretics operate either by exciting the force of the circulation, or by exciting the action of the extreme vessels on the surface of the body only: and these two operations take place sometimes separately, and sometimes together.

The medicines which operate in these two ways are properly the diaphoretics we are to treat of. But there are various circumstances of the body which may produce these effects: and there may be medicines which produce these general circumstances of the system, which may be, though not strictly, named Diaphoretics. But they are the proper diaphoretics we are only to treat of here.

With respect to the operation of these, as the water of the blood passes out by urine or perspiration, so the quantity of these excretions, as said above, will be in proportion to the quantity of water for the time present in the mass of blood. And the passing of it by the one excretion or the other will be determined by certain circumstances of the œconomy, which it is proper for us here to consider.

The general force of the circulation, and the activity of the extreme vessels, are what determine to, and support both perspiration and sweat. The latter circumstance, the activity of the extreme vessels, may depend upon the heat of the air applied to the surface of the body, or upon cold applied, whilst the circulation is by exercise, or other causes, in a vigorous state.

The determination to the kidneys seems to depend upon the saline state of the serosity fitted to pass by that secretion, whilst the situation of the kidneys is fitted for a copious secretion of the watery parts of the blood.

Whether there are any parts of the mass of blood which, without exciting the general circulation, are particularly fitted to pass by the skin, I cannot positively determine. But am disposed to think there are none such; as the function of perspiration does not appear to be a glandular secretion, but merely an exhalation.

The action of the exhalant vessels may be excited by heat, friction, and stimulant substances applied externally. But it is difficult for me to conceive that any medicine, without affecting the general circulation, can be conveyed to the extreme vessels so as to act on these only, or so universally on these, as in the production of sweat must be supposed.

From the whole of what is said, it would appear that there are no diaphoretics strictly to be so called, that is, internal medicines, acting upon the organs of perspiration alone: and if, however, it appears that the action of the extreme vessels is excited without any increased action of the general powers of circulation, it must

be by medicines acting upon certain parts of the system, which by a consent of nerves, can excite the action of these extreme vessels. When we are therefore to speak of the particular medicines enumerated under the present title, we are to speak of all of them under the idea of their being sudorifics, whether acting upon the general circulation or upon the extreme vessels only, and in either case under a certain administration. But before entering upon this last circumstance of administration, and to explain wherein it consists, it is necessary to observe, that under the most powerful determination to the skin, we find that a certain application of heat to the surface of the body, without any assistance from powers internally applied, is sufficient to produce sweating; and that external cold applied can almost certainly prevent the same, though considerable powers are employed from within.

The application of heat therefore to the surface of the body, and the avoiding of external cold, are circumstances almost absolutely necessary to favour the operation of sudorifics.

These circumstances may be obtained by the heat of the air applied, as in what is called the dry bagnio, or by increasing the heat of the surface by previous warm bathing, or by accumulating the warm effluvia of the body itself upon its surface. This last may be done by covering up the body very closely with such coverings as may both prevent the escape of the warm effluvia arising from the body itself, and may at the same time prevent the access of external cold; the theory of both which contrivances is, we believe, commonly understood.

To favour the operation of sudorifics, another means may be joined, which is, the taking into the stomach a quantity of warm liquid, which not only excites the general circulation, but particularly, by the consent of the vessels on the surface of the body with the stomach, excites the action of those vessels which pour out sweat.

These two means of covering up the body very closely, and taking warm liquids into the stomach, are what we call the sudorific regimen; which will often alone answer the purpose of exciting sweat; is often necessary to the operation of sudorifics; and will always render their operation more complete and permanent.

Having thus, as well as we can, explained the operation of diaphoretics in general, and the measures proper and often necessary in their administration, we would next consider their general effects upon the system.

To this purpose we say, that as their operation often depends upon their exciting the action of the heart and arteries, and thereby exciting the impetus of the blood in every part of the system; so they may be useful in all cases in which the circulation is languid, and when the powers of it are inert.—This is sufficiently evident in general: but the application of it to particular diseases is somewhat uncertain; for it is difficult to determine in what cir-

cumstances the practice may be safe. The languor of the circulation may be owing to the diminished energy of the brain, from causes acting especially in the brain itself. And in what cases the increased action of the heart and arteries will remove these causes, and restore the energy of the brain is very uncertain.

For example, in what cases of apoplexy and palsy the action of the heart and arteries may be safely increased, it is difficult to determine: and I am persuaded, that in very few instances of these diseases the practice is admissible; and that, for the most part, it is ready to do much harm.

When the effects of the diminished energy of the brain appears, especially in the state of the circulation, the applying of a stimulus to the heart and arteries may seem to be more safe and proper. But it is difficult to give the due measure to such a stimulus, so as to render it both safe and durable. And we commonly find that tonics and exercise are both safer, and at the same time commonly more effectual. In that general loss of tone which we call a Cachexy, tonics, rather than stimulants, are found to be the remedies.

When there are any fixed obstructions in any part of the system, it is difficult to determine when the increased impetus of the circulation is capable of overcoming and removing them: and much random judgment has been produced on this subject; while it is very evident, that when such increased impetus is not capable of overcoming the obstruction, it is likely to prove very hurtful.

When it happens that the action of the heart and arteries is already considerably increased, it will be readily supposed, that medicines which increase the same, would be improper: and so far as they operate only by increasing the action of the heart and arteries, they may certainly be hurtful. But as nature has intended that the effects of the increased impetus of the blood should be obviated by the flowing of sweat; so, when the operation of sudorifics, especially of those acting upon the extreme vessels alone, produces this effect, it is possible that this sweating may not only render the first operation of sudorifics safe, even in cases where the impetus of the blood was before preternaturally increased, but may also prove a means of removing the causes of that preternatural increase, and prove a remedy of the disease.

This leads to the consideration of the effects and benefit of sweating in fevers and phlegmasiæ. In the former we do not doubt but that sweating, any how excited, may sometimes prove a remedy: but it is at the same time extremely doubtful, whether it can be such when it is excited by medicines acting upon the heart and arteries: and we are certain that such medicines are generally hurtful. But on the other hand, when the sweating has been brought on by medicines which act upon the extreme vessels only, as these remove the spasm of the extreme vessels which supports the fever, they may be a cure of the disease. I am clearly of opinion, that

sweating, by such a remedy, may in most cases be employed. But I have not attempted it so often as to allow me to be very positive in advising it to be universally practised.

In certain fevers, in which it is supposed that the contagion which had produced the disease continues to be diffused over the system, and that the cure of the disease depends upon the expulsion of this matter, it has been proposed to cure such a disease by copious sweating. Such is the case of the plague, which has been very universally treated by such a remedy: and without having had some experience in the disease, I cannot presume to condemn the practice. But I have many doubts to propose with respect to it: and that is enough to be said here, where the discussion could not be properly introduced. We cannot, however, dismiss the subject, without observing, that *Chenot*, an experienced practitioner, and one of the latest writers, is of opinion, that the copious sweatings formerly practised, are by no means necessary; and that the judicious *De Mertens*, who writes of the plague of Moscow in 1771, does not propose sweating as one of the remedies to be employed.

In the case of the phlegmasiæ, there is more difficulty in determining the propriety of sweating. But it may in some measure be determined in the same manner, that is, according to the means of bringing it on. By heating, and what may be called inflammatory medicines, it is certainly improper: but by medicines acting upon the extreme vessels alone, it may be more safe.

As we have however found, that sweating, even by the most simple sudorific regimen, sometimes aggravated inflammatory diseases; we must say, that it is to be employed with doubt and caution. At the same time, however, the effects of *Dover's* powder in rheumatism show, that sweating is not only compatible with, but may prove a remedy in a very inflammatory state of the system. We must, however, conclude with observing, that what are the circumstances of the particular phlegmasiæ that may determine for or against this practice, is not sufficiently ascertained.

Medicines which promote the discharge by the skin may be supposed to be remedies in the diseases of that part of the system; and they may probably be such. But the distinction and pathology of cutaneous affections are with me still involved in so much obscurity, that I am not able to speak with any precision or clearness on the subject.

It may be supposed, when certain acrimonies are diffused over the whole system, that sweating may be a probable means of carrying them out. And upon this footing it has been supposed, that sweating, by certain very powerful sudorifics, may be a means of curing the lues venerea: and it is alleged that it has actually proved such. But it is not necessary at present to enter into the discussions either of the fact or the probability of it; as it is in few cases that we shall think of having recourse to the practice.

It has been supposed that sweating, like other serous evacuations, may occasion an absorption of serum from the cavities in which it has been accumulated in the various species of dropsy : and in some instances this seems to have happened. But it does not happen so readily and constantly as to render the practice preferable to the other practices which may be employed for the same purpose.

PARTICULAR DIAPHORETICS.

These are arranged in my catalogue according as they seem to act especially upon the heart and great arteries, or as we suppose them to act more especially upon the extreme vessels : and I have begun to enumerate these as we suppose them to act in the first manner.

Those here enumerated may all be allowed to stimulate the heart and arteries : but in this they are of very different degrees of force. And many of them are so weak, that without great assistance from a sudorific regimen, they are not capable to excite sweat. Such are the *Calendula*, *Crocus*, *Dulcamara*, *Salvia*, *Scordium*, *Sassafras*, *Sarsaparilla* ; all of which, with very little choice, may be employed, but without any advantage that I can perceive.

There are other medicines in my list which are more powerful, and require less assistance of the sudorific regimen ; such as the volatile alkali, wine, and alcohol, and the essential oils, or the aromatics from which these are obtained. The volatile alkali, in moderate quantity, may be often conveniently employed for assisting the sudorific regimen ; and the same may be said of wine and alcohol in moderate doses. But they are in danger of going to excess ; and in large doses are to be considered in another light. The essential oils, or the aromatics from which they are drawn are of the heating and inflammatory kind ; and may be employed sometimes as diaphoretic stimulants, but hardly in any case for the purpose of sweating.

The *Contrayerva* and *Serpentaria* are powerful stimulants, especially the last. And both have been employed in fevers in which a debility prevailed ; but with what propriety seems to me very doubtful. I am persuaded that wine may always supersede the stimulant power of these medicines ; and that debility is better remedied by the tonic and antiseptic powers of cold and Peruvian bark than by any stimulants.

On the subject of the *Contrayerva* and *Serpentaria*, I cannot avoid transcribing the words of the judicious *De Mertens*.

“ *Radices contrayerva et serpentariae Virginianae a præstantissimis in arte viris tanquam optima remedia antiseptica laudatas in febribus putridis, schummodo quando vires deficiunt, et quidem rarissime adhibeo ; experientia edoctus, illas corpori ingestas minus prodessse virtute antiseptica, qualem experimenta in lagenis vel ollis instituta ipsis inesse demonstrant, quam vi calefaciente nocere. Putredinis humorum arcendæ et corrigendæ scopum solus absolvit cortex*

Peruvianus : et ubi cardiacis opus est, vinum cateris anteferendum mihi videtur." And in a note he has this stricture on two celebrated English physicians : "*Huxham et Pringle, qui has radices commendant, venæ sectionem initio harum febrium suadent : et in statu morbi vires stimulantibus excitare tentant.*"

Of all the diaphoretics that may be employed to excite the general circulation, I hold the guaiacum to be one of the most valuable; as it affords a matter which passes more entirely to the extreme vessels, and seems to stimulate the exhalants more in proportion than it does the heart and great arteries. By this means it is both a more safe and more effectual sudorific than those which stimulate the latter almost only. It is on this account that it may be justly considered as more effectual than other sudorifics in the cure of the lues venerea; and it is probably upon the same ground that it has been found so useful in all cases of rheumatism, and perhaps in those of gout.

Having thus considered the several diaphoretics which operate by exciting the powers of the general circulation, I must now speak of those which operate more especially or almost only, upon the extreme vessels.

In making up my Catalogue I thought of inserting in this place *Aqua frigida*. I still think I should have done it; and therefore shall speak of it here.

Taken into the stomach, it is a powerful means of exciting the action of the extreme vessels. And with the assistance of covering the body very closely, it may be employed for exciting sweat.

Galen and his immediate followers, as well as those of the 16th century, seem to have made much use of cold water, and frequently for the purpose of exciting sweat. But in more modern times, such practices, so far as I know, have been seldom followed: and therefore, with respect to the effects or propriety of them, I cannot properly give any opinion, but must advise my readers to consult the Galenic writers, particularly *Lommius*, upon the subject; and further, to consider two passages in *Celsus*, in Chap. VII. and IX. of his third book, which mention the exciting sweat by a large quantity of cold water thrown into the stomach, and thereby curing fevers.

After thus supplying my omission of cold water, I proceed to mention the other articles of my Catalogue, which act especially upon the extreme vessels.

The first are the Acid Salts, of which the fossil species may be employed, but cannot be conveniently thrown in so suddenly as to be well adapted to sweating: and therefore the vegetable acids have been more commonly employed. Of these the fermented acid of vinegar has been considered as the most effectual. And a whey made with a large proportion of vinegar proves commonly a very effectual sudorific. It has therefore been supposed, that vinegar has a power of attenuating the fluids. But this, upon the

doctrines laid down before with respect to attenuants, cannot be admitted: and we maintain that its sudorific power depends entirely upon its refrigerant power in the stomach, analogous to what we are to say with regard to other saline diaphoretics.

SALES NEUTRI.

These are evidently, with a proper regimen, powerful sudorifics, and have been frequently employed as such. For the use of nitre in this way, see *Dr. Brocklesby's* Observations, published in 1764.

For the sudorific powers of the sal ammoniacus, see *Muys de Sale Ammoniaco*: and it appears from *Boerhaave*, that the sal digestivum, or febrifugum sylvii, has been employed to the same purpose. In mentioning these sudorific neutrals I need hardly add, that the saline mixture or neutral, formed of an alkali joined with the native acid of vegetables, is properly employed in favouring and supporting sweat.

ANTIMONIUM.

We have said above that this medicine, operating, as it always does, more or less on the stomach, by that operation excites the action of the extreme vessels. This is often to the degree of exciting sweat: and whether for this purpose certain preparations of it are more fit than others, I would not positively determine. In the case of fevers, we are clearly of opinion, that our nauseating doses have the best effects when they produce some sweating; and that when the antimonial alone does not readily do that, it should be assisted by some neutral salt joined to it.

In other cases, as of rheumatism, or other inflammatory disease, the antimonial may be more certainly and properly determined to excite some sweating, by being joined with more or less of opium.

In my Catalogue, I think I should have set down a general title of Emetics; as, from the analogy of antimony, we conclude, that all emetics are at the same time diaphoretics, and may very often be employed for exciting sweat.

OPIUM.

This substance has been at all times considered as a powerful sudorific: and there has hardly been any celebrated sudorific composition that has not had this as a chief ingredient in it. Though I have treated above pretty largely of the medicinal qualities of this substance, it is still properly considered here: and the question that especially occurs to us, is to explain upon what the sudorific powers of opium especially depend.

To this purpose we shall allow, that the stimulant power of opium in exciting the action of the heart and arteries, may have a chief part in its producing sweat. But I maintain that opium does this more readily, and more safely, than any stimulants which operate in the same manner; and this may be accounted for, and in my opinion can only be accounted for, by supposing that opium with its stimulant, at the same time exerts its sedative powers.

These must especially affect the parts most distant from the sensorium, which are the extreme vessels every where.—It manifestly diminishes the activity of these vessels, and therefore suppresses all excretions. But even this must be with some relaxation of their tone and tension, whence they may more easily yield to the increased impetus of the blood in the great vessels. In this manner we account for the sudorific powers of this substance: and we presume that it is consistent with all the several operations and medicinal qualities of opium which we have mentioned above, and which it is not therefore necessary for us to repeat here.

MOSCHUS.

When this is given in large doses, it commonly induces sleep, and almost as certainly occasions a profuse sweat. It is therefore properly considered here as a sudorific: and its operation is explained by the same reasoning we have just now employed on the subject of opium. In its turn the consideration of musk illustrates and confirms that reasoning.

In the catalogue of diaphoretics there are two articles which I have not yet taken notice of: and I doubt if they should have been inserted. The first of these is camphor, which, with a sudorific regiinen, might perhaps be employed. But in the frequent exhibitions of it which I have been acquainted with, I have not observed its tendency to excite sweating; and therefore think it was not properly inserted in my list.

The other article I should have taken notice of is the Hydrargyrus. This certainly reaches the extreme vessels, and excites their action: and the most acrid preparation, the corrosive sublimate, sometimes excites sweating. But neither this nor the other preparations are given intentionally for this purpose; nor in my opinion could they be conveniently employed as sudorifics, which must always operate more suddenly than a moderate dose of mercury could be supposed to concur with them.

CHAPTER XXIII.

MENAGOGA.

THESE are the medicines suited to promote the menstrual discharge which occurs in the female sex.—A set of medicines the most unfaithful; and very frequently disappointing our expectations from them.

The writers on the materia medica, both ancient and modern, particularly the former, mention many medicines as emmenagogues: and I have employed a great number of those recommended by them: but I have been so very often disappointed of the wished for effects, that I have ventured to allege that the ancient writers had not on this subject spoken from experience. Those

disappointments which I have met with, I find to have also happened to my fellow practitioners: and I have not, amongst the most experienced, found any one who does not acknowledge his failures in employing the emmenagogue medicines recommended by writers; nor who does not own, that he cannot, almost in any case of amenorrhœa, with confidence, promise success in curing it.

What is the foundation of this failure, it is not easy to assign. But I judge it to be owing to this, that we have not yet found out a medicine which has any specific power in stimulating the vessels of the uterus; and farther, to explain this, I must make a few remarks upon the nature of the menstrual discharge.

I suppose then, that in consequence of the gradual evolution of the system, at a certain period of life, the vessels of the uterus are diluted and filled; and that by this congestion, these vessels are stimulated to a stronger action, by which their extremities are forced upon and pour out blood. According to this idea it will appear, that I suppose the menstrual discharge to be upon the footing of an active hæmorrhagy; which by the laws of the œconomy is disposed to return, after a certain interval, and which, after some repetition, may, by the power of habit, be determined to return at regular periods.—This is my general idea, which I think may be rendered applicable to all the various phenomena and accidental occurrences which happen with respect to this discharge. It would not, however, be proper to enter into such an explanation here; and for my present purpose I am to make use of only one circumstance: this is, that as in all active hæmorrhagies the flowing of blood depends especially upon the increased action of the vessels of the part; so in the uterine discharge it depends upon an increased action in the vessels of the uterus.

To apply this more particularly, we must observe, that the interruption of this discharge is in two different states; one of which is, when the menses do not flow about the time of life that is the most usual with the sex; and the other is, when the flow having been established at its usual periods for some time, it is by certain causes interrupted from returning at its usual times. These two states are well known under the titles of the *Retention* and the *Suppression* of the menstrual discharge. The first state, that of retention, we suppose to depend upon some weakness of action in the vessels of the uterus; the other, of suppression, we suppose to depend upon some constriction in the extremities of the same vessels, which prevents their yielding to the usual impetus of the blood flowing in the larger portions of them.

The whole of the above remarks might perhaps have been omitted here, by referring my readers to the VI and VIII Chapters of the Fourth book of my *First Lines*, from which they may still take the doctrine more fully. But in an introduction to the *Medicamenta Menagoga*, I thought it necessary to give the general doctrine; which amounts to this, that the medicines which are to be

employed in both the states of amenorrhœa, are chiefly those which strengthen and increase the action of the vessels of the uterus : and with this explanation I proceed now to make some remarks upon

PARTICULAR EMMENAGOGUES.

ALOE.

Of this we have treated in its proper place amongst the purgatives ; and there too we have made our remarks upon its supposed emmenagogue virtues.

GUMMI FOETIDA, ET PLANTAE FOETIDAE.

Of these I have treated above, under the head of antispasmodics ; and have there insinuated, that they have seldom or never answered my expectations in practice as emmenagogues. But I have said that there may be some fallacy in my experiments, and certainly I could not disregard the general opinion so much as to omit them here.

CROCUS.

I must say the same with respect to this article. But I have given above my reasons for suspecting that it is a medicine for the most part insignificant.

CASTOREUM.

Of this also I have treated above as an antispasmodic ; and perhaps that virtue is a good reason for introducing it here : but besides that, it has as good a right to be considered as an emmenagogue as any of the disagreeable odours which we have mentioned as such before. The Castor is commonly enough joined with the foetid gums : and whenever I have employed these with any success, I am of opinion that the castor had a great share in producing the effects.

With respect to the castor, let it be observed, that as it is in our shops it is in different conditions ; that the most odorous is the most powerful medicine ; and that some of the kinds of little odour have hardly any power at all.

FERRUM.

This we have also treated of before as an astringent and tonic medicine : but we have introduced it here as commonly supposed to be a very powerful emmenagogue. From the principles we have laid down above, it will readily appear, that, in the cases of retention, attended as they commonly are with a general flaccidity of the system, the tonic powers of iron are likely to be the most powerful remedy : but at the same time, it will be probable that, in the cases of suppression depending upon a constriction of the extremities of the vessels of the uterus, the same tonic powers may not be so properly employed.

HYDRARGYRUS.

This, as an universal stimulant, and as very commonly reaching the extreme vessels, may be capable of stimulating those of

the uterus, and therefore of proving an emmenagogue. Upon this supposition it is introduced here; and, from several trials, I am persuaded that the continued use of mercury has proved a cure of suppressions. How far it may be employed in cases of retention I am uncertain; but am of opinion, that it can be neither so safely nor so effectually employed in these as in the cases of suppression.

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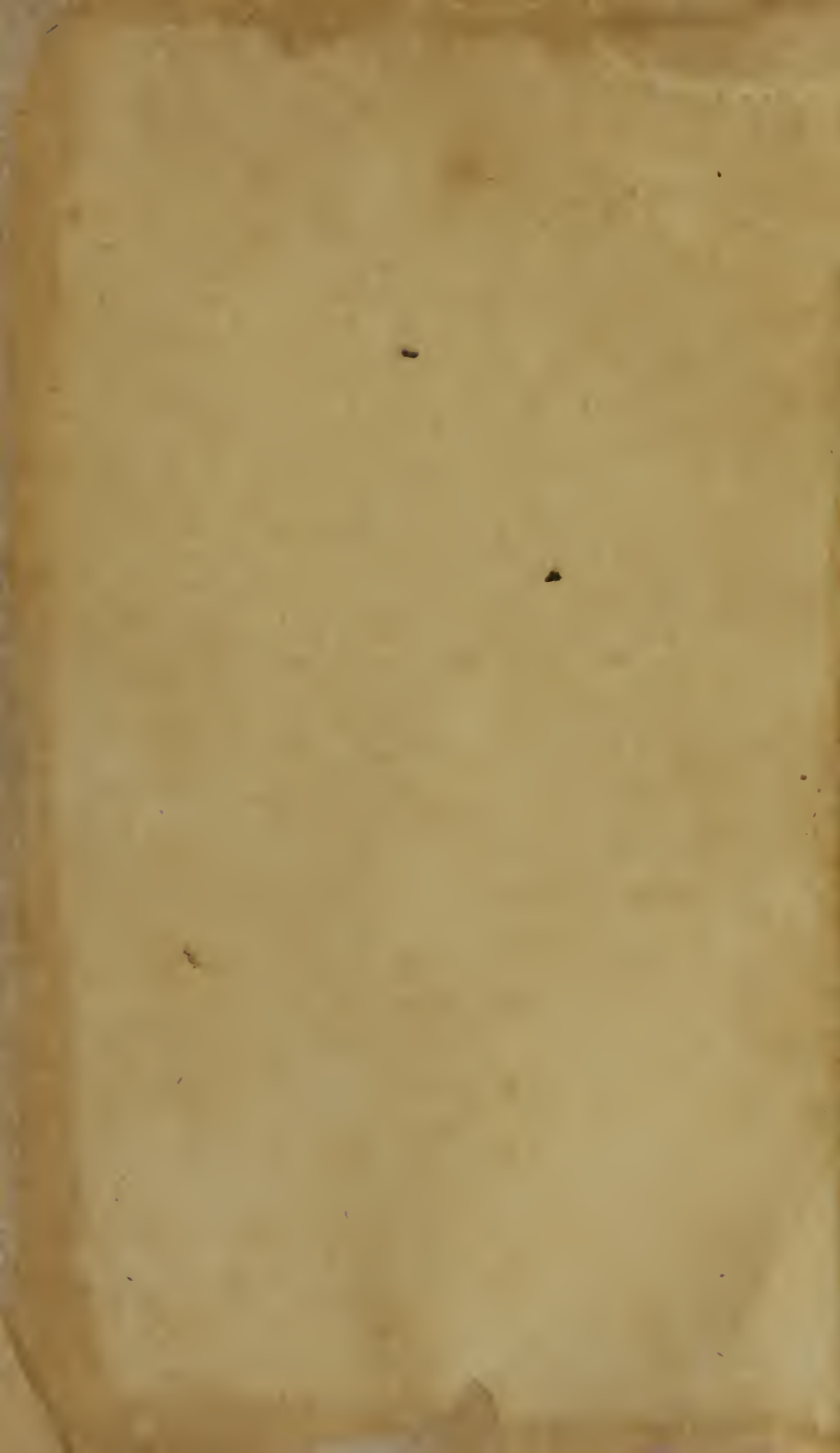
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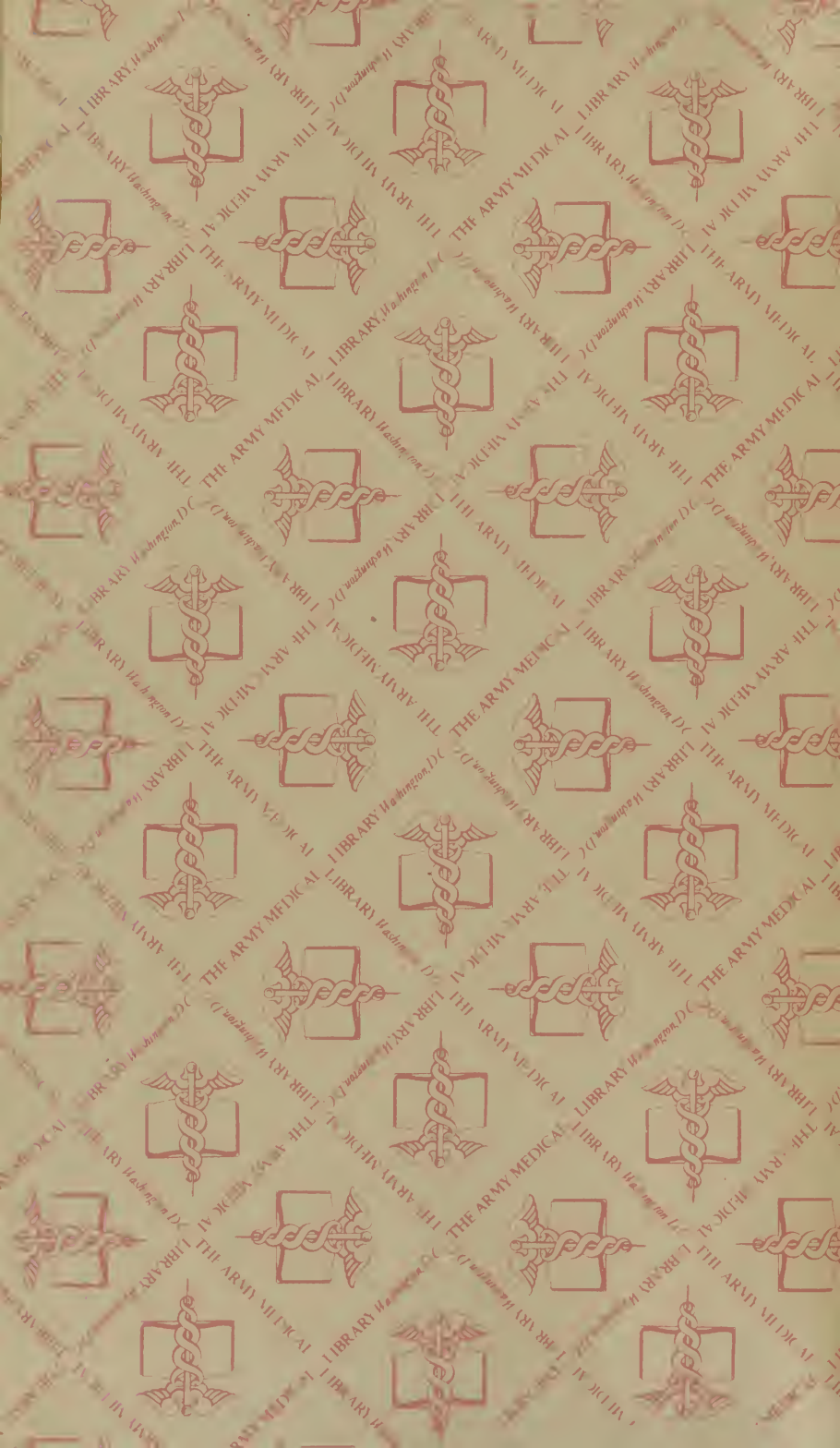
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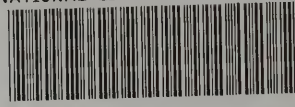
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